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CONTRIBUTION TO THE STUDY OF THE MIOCENE OF THE FLORIDA PANHANDLE

HARBANS S. PURI

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LETTER OF TRANSMITTAL

Florida Geological Survey

Tallahassee

October 10, 1953

MR. CHARLIE BEVIS, *Supervisor*
FLORIDA STATE BOARD OF CONSERVATION
TALLAHASSEE, FLORIDA

SIR:

The sediments of Miocene age exposed in the State of Florida are the type marine section for all of the Miocene rocks of the southeastern United States. These rocks are economically important throughout much of the Gulf Coast in that they contain oil in the State of Louisiana, and possibly Mississippi, and considerable quantities of phosphate in Florida. A better understanding of the Miocene stratigraphy is of tremendous importance in the discovery of additional reserves of both oil and phosphate.

This report, entitled, "Contribution To The Study Of The Miocene Of The Florida Panhandle," was prepared by Dr. Harbans S. Puri, Micropaleontologist of this department. It is a comprehensive report that contributes much new data to the stratigraphy of the Miocene section. In part, the report is also a partial reprint of Bulletins 4 and 9, issued by this department in former years, the editions having been exhausted. We have had numerous requests for reprinting these bulletins and we are delighted to bring the nomenclature and taxonomy up to date and to make these papers available once again.

Dr. Puri has also contributed to the knowledge of the microfauna of these beds, through the description of a number of species of ostracods.

Respectfully yours,

HERMAN GUNTER, *Director*

ABSTRACT

In the standard section of the Miocene of western Florida, there has been considerable doubt as to the sequence of the various formations. This doubt may be attributed to the scattered nature of outcrops, the homogeneity of the sediments, and lack of data on the strike, dip, thickness and structure of these beds. Stratigraphy was based entirely on supposed faunal evolutions, disregarding biofacies, lithotopes and biotopes.

The present study embraces Okaloosa, Walton, Holmes, Washington, Bay, Jackson, Calhoun, Gulf, Liberty, Franklin, Gadsden, Leon, and Wakulla counties. Samples from 58 outcrops, 20 auger holes and two water wells were studied. Stratigraphic sections and faunas of the Miocene of the Florida panhandle indicate the presence of a number of lithofacies and biofacies, which are a measure of recurrence of similar conditions and are reflected in both the lithology and fauna. Similar depositional types of equivalent age are considered as stages while the dissimilar components within the stages are designated as facies. Three stages are recognized, Tampa, Alum Bluff and Choctawhatchee.

The Tampa Stage includes in part the "lower" Miocene sediments in the Florida panhandle and its equivalents in the central and western Gulf States. The type area is near Tampa Bay and includes the famous Ballast Point locality which is now largely covered and the Sixmile Creek locality at Orient, Hillsborough County, Florida. The Stage includes all sediments deposited between post-Vicksburg and pre-Alum Bluff Ages. In the Florida panhandle, two lithofacies are recognized: a calcareous St. Marks facies and a silty Chattahoochee facies.

The Alum Bluff Stage embraces all sediments of post-Tampa and pre-Choctawhatchee Age ("middle Miocene") in the Florida panhandle and their equivalents in the central and western Gulf States. The type locality consists of exposures at Alum Bluff, Liberty County, Florida. In the Florida panhandle, four lithofacies, Chipola, Oak Grove, Shoal River and Hawthorn are recognized within the Alum Bluff Stage.

The Choctawhatchee Stage includes all Miocene sediments of post-Alum Bluff Age in the Florida panhandle and their equivalents

in the central and western Gulf States. The type locality is in the vicinity of Red Bay, Walton County, Florida. In the Florida panhandle, four faunal facies, *Yoldia, Arca, Ecphora* and *Cancellaria* are recognized within the Stage.

The lithofacies recognized here have previously been considered to be formations while the faunal facies have been considered to be zones. In both instances, however, faunas basically determine the age equivalents of the sediments.

PREFACE

The Miocene rocks of the Florida Panhandle are the type marine section of the Gulf and southeastern United States and the present study of these sediments was logically sponsored by the Florida Geological Survey. The major portion of the work was done at the School of Geology, Louisiana State University, under the supervision of Doctor Henry V. Howe, Director, School of Geology, Louisiana State University. A portion of Part I was submitted to the graduate faculty of L.S.U. in partial fulfillment of the requirements of the degree of Doctor of Philosophy in June, 1953.

This study was initiated toward the end of 1949, when the writer took the task of a detailed study of the ostracode fauna of the Miocene of the Florida Panhandle. Several taxonomic and nomenclatural problems were encountered during this study and the writer tried to unravel some of them (Puri, 1952a, 1952b, 1953a, 1953b, 1953c). When the ostracode faunal studies were finally completed in the middle of 1950, it was realized that the faunas did not agree with the standard stratigraphic section set up by Gardner (1926), Mansfield and Ponton (1932), Cushman and Ponton (1932), and Smith (1941). A different, but more logical interpretation, was offered by Vernon (1942), who, after a detailed study of the sections in Washington and Holmes counties, came to the conclusion that the Shoal River formation was possibly the updip facies of the Chipola formation, and that the *Ecphora* and *Cancellaria* facies were definitely the updip facies of the *Arca* and *Yoldia* facies. This radically different interpretation was based on the fact that nowhere in Washington and Holmes counties was the Shoal River formation known to overlie the Chipola formation nor were the *Ecphora* and *Cancellaria* facies known to overlie the *Arca* facies (Vernon, 1942). Vernon (1942, p. 75), thus summarized the situation:

> "Whether the Alum Bluff sediments constitute a single mappable formation in the area considered in this report (Washington and Holmes counties) and a group consisting of three formations elsewhere must await detailed mapping in Walton and Okaloosa counties."

The whole problem was discussed with Dr. Robert O. Vernon, in the fall of 1950, and it was suggested that the study be expanded and the problem be approached on a regional basis and attacked not only faunistically but also ecologically and structurally. Such a study included the examination of foraminiferal assemblages to strengthen the evidence furnished by Ostracoda in the interpretation of ecologic history. Several auger holes were drilled in Washington County to prove definitely the stratigraphic relationship of the various formations of the standard Miocene section. Further evidence was obtained from two water well sections in the area. The present report, which is bio-stratigraphic, is the result of such an expansion.

The writer is grateful to Drs. Henry V. Howe, Robert O. Vernon, Herman Gunter and Grover E. Murray for their help and criticism. Most of the work was completed at the Louisiana State University and the final manuscript was assembled at the Florida Geological Survey office. Mr. Andrew R. Janson and Miss Doryand P. Janson assisted in the preparation of illustrations that accompany this report. Mrs. Mary Blount's and Miss Martha A. Walker's assistance in assembling the final manuscript is greatly appreciated.

All types are catalogued in the Henry V. Howe Collection, Louisiana State University, Baton Rouge, Louisiana; slide numbers referred to in this report are as catalogued in the Henry V. Howe Collection. A duplicate set of types is deposited in the Florida Geological Survey Museum.

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STRATIGRAPHY

INTRODUCTION

The Miocene rocks of Florida have been studied by several noted geologists. Earlier work of most pioneer geologists was exploratory; some of them considered these rocks to be of upper Eocene (Conrad, 1846a, pp. 36-48; 1846b, pp. 399-400; Tuomey, 1851, pp. 390-4) or Oligocene age (Heilprin, 1884, pp. 115-154; 1887). Their age determinations were based on erroneously identified fossils. Very little was known in regard to stratigraphy which was almost entirely based on paleontology. This was due in part to the rarity and scattered nature of outcrops of the Miocene and in part to the homogeneous nature of the sediments which made it difficult to identify them without the use of fossils. Very little was known about the thickness of these beds, their structure, strike and dip. Little effort was made to differentiate the various lithofacies, biofacies, lithotopes, and biotopes. That the stratigraphy was based entirely on faunal evolution is ably summarized by Gardner (1926, p. 1) in her studies of the molluscan fauna of the Alum Bluff group:

> "The detailed study of the stratigraphy will follow the systematic treatment of the fauna, for the stratigraphy is in large measure deduced from the fauna."

No effort was then made to differentiate between rock, time and time-rock units. Most of the famous Miocene localities were described by Julia Gardner (1926), W. C. Mansfield (1937) and J. A. Cushman and G. M. Ponton (1932) and a "standard" section was set up by them for the middle Miocene of North America. Later work has been based mostly on this assumed section.

The writer makes no pretense of presenting a complete survey of the Miocene stratigraphic nomenclature. Notes on stratigraphic terminology are added wherever pertinent and the type localities of the stratigraphic units are given. Table 1 shows the correlation of the "standard" section used by Cushman and Ponton (1932), Smith (1941), Vernon (1942) and Cooke (1945) with the section used in this article.

Cushman and Ponton, 1932

Series	Stage	Group	Formation	Faunizones
Miocene	Upper		Choctawhatchee	*Cancellaria* zone
				Ecphora zone
	Middle			*Arca* zone
				Yoldia zone
		Alum Bluff	Shoal River	*Cardium* bed
				Middle zone
				Type zone
			Oak Grove Sand	Transition zone
				Type zone
	Lower		Chipola	
			Tampa Limestone	

Smith, 1941

Stage	Group	Formation	Faunizones
Upper		Choctawhatchee	*Cancellaria* zone
			Ecphora zone
Middle			Permenter's farm beds
			Arca zone
			Yoldia zone
	Alum Bluff	Shoal River	Lower beds at Spence's farm
			Cardium bed
			Type Shoal River / White Creek beds
			Godwin Bridge beds
		Oak Grove Sand	Upper Oak Grove
			Type Oak Grove
Lower		Chipola	
		Tampa Limestone	

Vernon, 1942

Group	Formation	Faunizones
	Choctawhatchee	*Arca* and *Yoldia* facies; *Ecphora* and *Cancellaria* facies
Alum Bluff	Shoal River / Chipola	
	Tampa	

Cooke, 1945

Group	Formation	Faunizones
	Duplin	*Cancellaria* zone
		Ecphora zone
Alum Bluff	Shoal River	*Arca rubisiniana* zone
		Yoldia waltonensis zone
		Glycymeris waltonensis zone
		Cardium taphrium zone
	Chipola	
	Tampa Limestone	

Present Interpretation Section Used in this Article

Group	Formation	Litho- and Faunal Facies (Limits coincide with formational and faunizonal boundries) — Updip to Downdip
		Choctawhatchee Stage: *Arca* Facies; *Yoldia* Facies; *Cancellaria* Facies; *Ecphora* Facies
		Alum Bluff Stage: Shoal River Facies; Chipola Facies; Hawthorn Facies (East of Apalachicola River); Oak Grove Facies
		Tampa Stage: Chattahoochee Facies; St Marks Facies

Table I
Correlation of Miocene Section of the Florida Panhandle with the Section used in this Article

A list of localities from which the samples were collected is given beginning on page 58, and their locations together with lines of sections appear on figure 1.

MIOCENE SERIES

TAMPA STAGE

The Tampa Stage includes all Miocene sediments lying between the Oligocene Series and the Alum Bluff Stage as defined in this paper. This definition includes such sediments exposed in the Florida panhandle and their equivalents in the Central and Western Gulf States. The type area is near Tampa Bay, the famous Ballast Point locality which is now largely covered, and on Sixmile Creek at Orient, Hillsborough County, Florida. The Stage includes all sediments deposited between post-Vicksburg *(Nodosaria blanpiedi* zone of the Chickasawhay limestone) and pre-Alum Bluff Ages. In the Florida panhandle, two lithofacies are recognized: a calcareous St. Marks facies downdip and a silty Chattahoochee facies updip, see figure 2.

The name Tampa was first used by Johnson (1888). Dall (1892) used the term Tampa limestone and also Tampa beds. Matson and Clapp (1909) used the name Tampa formation and also recognized that it was contemporaneous with the Chattahoochee formation. Cooke and Mossom (1929, pp. 78-79) changed it to Tampa limestone because the formation is chiefly limestone and redefined it to include in it the Chattahoochee formation. Vernon (1942) revived the original term, Tampa formation, to include "all sediments lying above the Suwannee limestone and below the Alum Bluff group." Lithologically, the Tampa consists of sands, silts, marls, subordinate limestone, and fullers earth downdip. The limestones are restricted to the lower part only.

The fossils described from the Tampa are principally Mollusca (Dall, 1890, 1915; Mansfield, 1937). The Foraminifera and Ostracoda fauna of the Tampa is meager and is largely undescribed. *Archaias floridanus* is the commonest species reported from the surface exposure.

Chattahoochee Facies

The name Chattahoochee (type locality, Chattahoochee Landing on the Apalachicola River, Gadsden County, Florida) was first in-

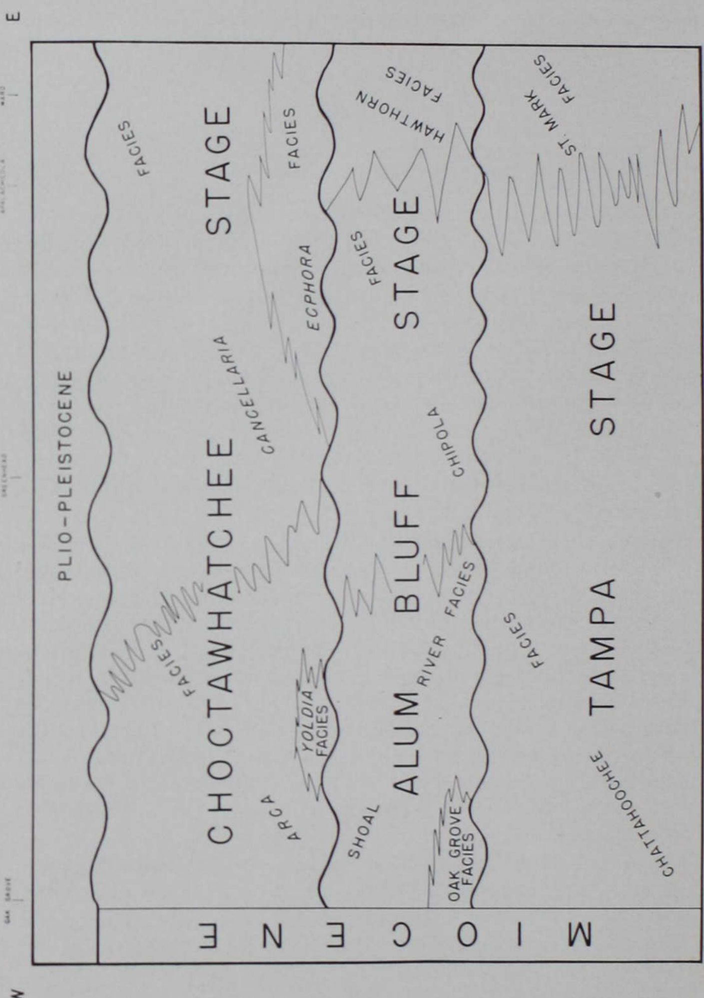

Figure 2
Diagrammatic Stratigraphic Section along A-A' showing suggested Facies Terminology

troduced by Langdon (1889, pp. 322-324) as a group. Langdon (1891a, pp. 90-97; 1891b, pp. 605-606) later changed it to "Chattahoochee series" and "Chattahoochee limestone." Foerste (1894, pp. 41-58) used the term, "Chattahoochee bed proper." Matson and Clapp (1909, pp. 74-84) referred to it as a formation. Cooke and Mossom (1929) abandoned the term Chattahoochee formation because it seemed to be the same age as the Tampa. The fossiliferous portions of the Chattahoochee limestone equal the Tampa according to Mansfield (1937) and Cooke (1945). The limestone is very clayey and silty and on many exposures the formation will not effervesce and appears to be largely white silt, but it is fossiliferous and contains several molluscan casts. Farther west this facies is predominately silty although in the vicinity of type locality several limestone beds are quite common. The section at Chattahoochee is described as lower Miocene in the Third Field Trip of the Southeastern Geological Society (1945). The term Chattahoochee is revived in this report to include the updip silty and clayey facies of the Tampa Stage.

The following section, located in the Southwest quarter of Section 29, Township 4 North, Range 6 West, on access road to dike of the Jim Woodruff Dam, directly below U. S. Engineers Office, on east side of Apalachicola River, was measured on February 27, 1953, by Vernon, Hendry, Puri, Winters and Yon. (Bed measured on west and north side of roadcut).

Bed		Feet
Alum Bluff Stage—Hawthorn facies (?)		
21	Quartz sand; red, yellow and white, fine to coarse-grained, graded bedding. Contains more quartz gravel at the base than at the top. Topped by about five feet of deep-red soil profile which contains limonitic polished sandy nodules	16
20	Quartz sand; mottled, light-gray, purple and yellow, fine to medium grained, very argillaceous	6.5
19	Covered	29
Alum Bluff Stage—Hawthorn facies		
18	Marl; variegated, cream and light-gray, contains fine-grained quartz sand, abundant *Pecten* and oyster shells within the bed	1±
17	Quartz sand; tan to light brownish-gray, medium to fine-grained argillaceous and becomes more argillaceous towards the top	8.1
16	Clay; dark greenish-gray, blocky, silty, and contains fine-grained quartz sand	3
15	Siltstone; light greenish-gray, which contains bright, waxy, clay nodules and hard, brown, crystalline, dolomitic limestone. Oyster reef development within the bed	4 5

Section discontinuous—Beds 14 to 1 measured about forty yards to the west.

Tampa Stage—Chattahoochee facies

14	Limestone; tan, dolomitic, hard, cryptocrystalline, thinly-bedded, pasty	6
13	Limestone; thinly-bedded and interbedded with green, calcareous, silty clay	.5
12	Limestone; light brownish-gray to cream, dolomitic, soft, tough, blocky, and contains quartz sand	1.5
11	Limestone; rubble of white, dolomitic, hard, pasty, irregular lenses of fossils within the bed. Top of bed has irregular surface along which light-green, crystalline calcite has been developed[1]	2.3
10	Limestone; light brownish-gray to cream, dolomitic, soft, tough, blocky, and contains quartz sand	4.5
9	Limestone; rubble of white, hard, pasty, irregular lenses of fossils within the bed. Top of bed has irregular surface along which light-green crystalline calcite has been developed. Bed lies irregularly upon Bed 8	2.5
8	Limestone; light-cream to white, soft, tough, pasty, and contains quartz sands; within the bed are irregular tunnels filled with calcareous, harder, green sand and clay. Contains irregular lenses and nodules of the above sand and clay. Lenses and nodules of crystalline calcite are present. Occurring at the top of the bed is a layer of medium-gray crystalline calcite about eight inches thick. The gastropod *Ampulella* is found within the bed	4.2
7	Limestone; rubble of white, dolomitic, hard, pasty, slightly fossiliferous, somewhat nodular, intermixed with sand and nodules of limestone	2.8
6	Limestone; white, pasty, silty, blocky, weathers spherical. Top four inches harder	2
5	Clay; light greenish-gray, contains thin seams and partings of sand and silt. Also contains limestone nodules appearing to be fossiliferous	.8
4	Limestone; very light brownish-gray, dolomitic, hard and tough where exposed. Contains numerous mollusk molds. Last two and one-half feet contain greenish-gray silt and light-green clay nodules which are fossiliferous. Weathers slightly harder than Bed 3.	8.1
3	Limestone; cream to white, soft, pasty, contains quartz sand. Numerous molds of *Turritella* spp., and other mollusks, *Sorites* sp., and *Archaias* sp., are present in the bed. Blebs of green clay are disseminated throughout	2
2	Limestone; white to cream, dolomitic, pasty	.1
1	Clay; light brownish-gray, silty, calcareous. Blebs of green clay disseminated throughout. Gradually becomes more calcareous and approaches a hard white marl near the top	13.6
	Total Thickness	119.2

St. Marks facies

The name St. Marks limestone (type locality, Wakulla County, Florida) was originally used by Finch (1823, pp. 31-43) in describing the occurrence of large oysters. Wakulla County is the best area to study the Mollusca of the St. Marks limestone. Mansfield (1937) considered the molluscan fauna to be that of the latest fauna of the Tampa formation. The name St. Marks is here revived to include the calcareous downdip facies of the Tampa.

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[1]NOTE: This rubble bed may represent a continental phase of the Alum Bluff Stage (Chipola facies)

The St. Marks facies near Tampa consists of a basal light-gray to yellow limestone, of which "Silex bed" is a part. The upper portion consists of greenish clay with calcareous nodules. Matson and Clapp (1909, p. 89) estimate its thickness in the subsurface to be 65 feet.

ALUM BLUFF STAGE

The Alum Bluff Stage embraces all sediments of post-Tampa and pre-Choctawhatchee Age, the "middle" Miocene of most authors, in the Florida panhandle and their equivalents in the Central and Western Gulf States. The type locality is the section exposed below the *Ecphora* zone of the Choctawhatchee Stage at Alum Bluff, Liberty County, Florida. In the Florida panhandle, four lithofacies, Chipola, Oak Grove, Shoal River and Hawthorn are recognized, see figure 2.

The name Alum Bluff group was used by Dall (1892, p. 112) for the unfossiliferous sand and clay strata intervening between the Chipola and the upper fossiliferous beds *(Ecphora* faunizone) at Alum Bluff on the east bank of the Apalachicola River, about four miles north of Bristol, Liberty County, Florida. Matson and Clapp (1909, pp. 91, 92) used the term Alum Bluff as a formation and extended it downwards to include as members the Chipola marl, the Oak Grove sand and the Shoal River marl. They also included in the Alum Bluff, tentatively as members, the Sopchoppy limestone of Dall, "limestone and marl on the Manatee River, near Ellenton," and the fullers earth and related deposits of northern Florida. Vaughan and Cooke (1914, pp. 250-253) pointed out that these deposits were equivalents of Dall's (1892, p. 107) Hawthorn beds and proposed to abandon the term Hawthorn formation as used by Matson and Clapp. Gardner (1926, p. 1) reinstated the group when she raised the Alum Bluff formation to group rank on the assumption that the faunal differences between the three members of the Alum Bluff (Chipola, Oak Grove, and Shoal River) were too great to justify their inclusion in a single formation. Cooke and Mossom (1929, pp. 98, 115, 116) revived the name Hawthorn formation for beds equivalent in age to the Alum Bluff group but represented by a different facies east of the Apalachicola River and in peninsular Florida. Cooke (1945, pp. 35, 137) divided the Alum Bluff group into two formations: a lower one, the Chipola or Hawthorn formation, and an upper one, the Shoal River formation, and dropped the term Oak Grove formation of Gardner (1926, p.

1). The Shoal River formation, as extended by Cooke, included four faunizones: *Cardium taphrium* faunizone (Oak Grove formation of Gardner), *Glycymeris waltonensis* faunizone (Shoal River formation of Gardner), *Yoldia waltonensis* faunizone (basal Choctawhatchee or *Yoldia* faunizone of Mansfield) and *Arca rubisiniana* faunizone (typical Choctawhatchee or *Arca* faunizone of Matson and Clapp). Based on work by Mansfield (1932), Cooke (1945, p. 168) implied that the *Yoldia* and *Arca* faunizones of the Choctawhatchee formation were grouped in the Shoal River formation because of the similarity of fauna. Although the *Arca* faunizone does show some apparent resemblance to the Shoal River fauna from which its species were evolved, the present study indicates that this similarity is not strong enough to justify the inclusion of the *Arca* zone in the Shoal River formation. The species of the *Arca* faunizone show a closer similarity to the species of the *Ecphora* and *Cancellaria* faunizones. Out of a total of 142 species of Ostracoda occurring in the Miocene of the Florida panhandle, there are thirteen species that are confined to the *Arca* faunizone; twenty-two species that are confined to the *Ecphora* and *Cancellaria* faunizones. There are only twelve species that occur in the *Arca* faunizone and the underlying beds, including the Chipola. On the other hand there are twenty-three species that are confined to the *Yoldia-Arca* faunizones and the *Ecphora-Cancellaria* faunizones. In other words, there are almost twice as many species confined to the *Yoldia-Arca* faunizones and the *Ecphora-Cancellaria* faunizones as those confined to the *Yoldia-Arca* faunizones and the rest of the Alum Bluff stage. It is clear from the fauna that the *Yoldia-Arca* faunizones are more closely allied with the *Ecphora-Cancellaria* faunizones than they are with the Alum Bluff. This is further amplified by the fact that *Yoldia*, *Arca*, *Ecphora* and *Cancellaria* faunizones really are faunal facies within the Choctawhatchee Stage (figs. 2 and 3). Their supposed superposition occurs only between the *Ecphora* and the *Cancellaria* and such a relationship is known to exist only at Jackson Bluff. Therefore, the inclusion of the *Yoldia* and the *Arca* faunizones in the Shoal River formation is no longer justified. Furthermore, a perfectly valid term, the Choctawhatchee formation (Matson and Clapp, 1909, p. 114) typified by the *Arca* faunizone, is available for their reception.

Chipola facies

The name Chipola formation was suggested by Burns (Dall, 1892, p. 122) for a shell bed exposed on the Chipola River below Bailey's Ferry and at Alum Bluff on the Apalachicola River. Dall and Stanley-Brown (1894, pp. 140-170) called these sediments the Chipola marl. Matson and Clapp (1909, p. 91) included these beds in their Alum Bluff formation as a member which was later raised to a formation by Gardner (1926, p. 1).

The Chipola facies at its type locality is blue-gray to yellowish-brown, highly fossiliferous marl studded with molluscan shells. About 28 feet of the Chipola is exposed at Tenmile Creek (locality 12). This marly facies is restricted to the vicinity of the Chipola and the Apalachicola rivers. Farther west, Cooke (1945, p. 161) recognized two facies: a sandy limestone which for the most part is buried; and a light-colored, coarse, sandy facies that includes lenses of clay.

As observed by Cooke (1945, p. 164), the Chipola facies at Alum Bluff consists of a lower four feet of yellowish calcareous clay with some fine quartz and an upper sixteen feet of cream to gray, tough, calcareous sand with some Mollusca. These thicknesses check with the measured section of this report; but the upper sixteen feet of these sediments are here included in the Hawthorn facies. The Chipola sediments at Alum Bluff are less calcareous than those at its type locality, where they are at least ten feet thick.

The following foraminiferal species have been found in the Chipola facies:

Clavulina tricarinata d'Orbigny
Quinqueloculina candeiana d'Orbigny
Q. chipolensis Cushman and Ponton
Q. crassa d'Orbigny var.
Massilina inaequalis Cushman
M. bosciana (d'Orbigny)
M. quadrans Cushman and Ponton
M. incisa Cushman and Ponton
M. spinata Cushman and Ponton
M. spinata chipolensis Cushman and Ponton
M. spinata glabrata Cushman and Ponton
Spiroloculina grateloupi d'Orbigny
Hauerina miocenica Cushman
Articulina sagra miocenica Cushman and Ponton
A. mayori Cushman
Triloculina trigonula (Lamarck)
T. oblonga (Montagu)
T. gracilis d'Orbigny
T. quadrilateralis d'Orbigny
T. quadrilateralis longicostata Cushman and Ponton
T. brongniartii d'Orbigny
Pyrgo denticulata (Brady)
Articulina advena (Cushman)
A. multilocularis (Brady, Parker and Jones)
Denticulina sp.
Sigmomorphina undulosa (Terquem)

Elphidium chipolensis (Cushman)
Puteolina proteus (d'Orbigny)
Peneroplis bradyi Cushman
Sorites sp.
Discorbis candeiana bullata Cushman and Ponton
D. n. sp. 1
Eponides repandus (Fichtel and Moll)
Asterigerina carinata d'Orbigny
Amphistegina chipolensis Cushman and Ponton
Cassidulina chipolensis Cushman and Ponton
Cibicides lobatulus (Walker and Jacob)
C. refulgens (Montfort)
Cibicidella variabilis (d'Orbigny)
Annulocibicides projectus Cushman and Ponton
Acervulina chipolensis Cushman and Ponton
Gypsina vesicularis Parker and Jones
Archaias sp.
Baggina n. sp. 1
Bigenerina sp.
Bolivina n. sp. 2
Buliminella n. sp. 1
Nonion advenum (Cushman)
Globulina rotundata (Bornemann)
Guttulina caudata d'Orbigny
Guttulina irregularis (d'Orbigny)
G. lactea (Walker and Jacob)
Virgulina n. sp. 1

The following species of Ostracoda are known to date only from the Chipola formation:[2]

Bythocypris minuta Puri, n.sp.
Caudites chipolensis Puri
Cytherella chipolensis Puri, n.sp.
Cytheretta calhounensis Smith
Haplocytheridea chipolensis (Stephenson)
H. gardnerae (Stephenson)
H. mariannensis (Stephenson)
Anomocytheridea floridana (Howe and Hough)
Cytherelloidea vernoni Sexton
C. umbonata Edwards
Hermania reticulata Puri, n.sp.
Kangarina chipolensis Puri, n.sp.
Krithe cf. *K. reniformis* (Brady)
Loxoconcha anderseni Puri, n.sp.
L. chipolensis Puri, n.sp.
Microcythere johnsoni Mincher
M. striata Puri, n.sp.
Paracypris chipolensis Puri, n.sp.
Paracytheridea chipolensis Stephenson
Procythereis calhounensis (Smith)

Shoal River facies

The name Shoal River marl was proposed by Matson and Clapp (1909, p. 104) for beds overlying Oak Grove sand and forming the upper member of their Alum Bluff formation. This interval

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[2]The ostracode fauna of the Miocene of West Florida has been described by the writer and appears as Part III of this bulletin.

was later raised to formation rank by Gardner (1926, p. 1). Cooke (1945, p. 168) extended the term Shoal River formation to include four members: Oak Grove formation of Gardner (Cooke's *Cardium taphrium* faunizone), Shoal River formation of Gardner (Cooke's *Glycymeris waltonensis* faunizone), *Yoldia* faunizone (basal Choctawhatchee of Mansfield), *Arca* faunizone (typical Choctawhatchee of Matson and Clapp). The term Shoal River is used here in its originally implied sense, as used by Matson and Clapp and Gardner, except that it is considered to be a facies within the Alum Bluff Stage.

The Shoal River facies consist predominantly of micaceous sand and clay. The following section is exposed at Spence farm, locality No. 22:

Choctawhatchee Stage, *Yoldia facies*	
Gray, micaceous, sandy clay with abundant *Yoldia* (junction apparently conformable)	8 feet
Alum Bluff Stage, Shoal River facies	
Gray, micaceous, sandy clay and sand with abundant Mollusca but no *Yoldia*	4 feet

The type locality of the Shoal River facies is the shell bed exposed on the right bank of the Shoal River, five miles north of Mossy Head, Walton County. About ten feet of greenish-gray, very argillaceous shell marl is exposed. The lower portion of the section is covered by debris and could not be seen. An auger hole (AS-232) was drilled on Shell Bluff to ascertain the exact thickness of the Shoal River facies at the type locality. The auger penetrated the Shoal River at fourteen feet and was still in the Shoal River facies when it was completed at 100 feet. The following is the detailed log:

	Feet
Plio-Pleistocene	
Coarse brown sand	0-5
Coarse orange to reddish sand with pea size gravel pebbles	5-10
Coarse orange sand with pebble conglomerate	10-14
Alum Bluff Stage—Shoal River facies	
Yellowish-brown plastic clay	14-20
Same as above	20-25
Yellowish green plastic clay	25-30
Same	30-35
Same	35-40
Same	40-45
Same	45-50
Same	50-55
Same	55-60
Greenish-gray very argillaceous shell marl	60-65
Greenish-gray shell marl and sand	65-70
Greenish-gray argillaceous shell marl	70-100

A minimum of 86 feet of the Shoal River facies is present in the vicinity of the type locality. Further well studies may establish its exact thickness.

The microfauna of the Shoal River facies is distinct and shows definite relationship with both the Oak Grove and the Chipola facies. Most of the species that are common in the Shoal River facies, the Chipola facies and the *Yoldia* faunizone of the Choctawhatchee formation are long-range forms. Some of them also occur in the *Arca* faunizone or even range throughout the Miocene.

The following foraminiferal species have been found only in the Shoal River:

Textularia warreni Cushman and Ellisor
Marginulina glabra d'Orbigny
Bulimina elongata d'Orbigny
Bolivina robusta Brady
Lamarckina atlantica Cushman
Siphonina jacksonensis limbosa Cushman
Nodosaria longiscata d'Orbigny

The following ostracode species has been found only in the Shoal River formation:

"*Cythereis*" sp.

Oak Grove facies

The name Oak Grove sand was first used by Dall and Stanley-Brown (1894, p. 166) for beds at Oak Grove on the Yellow River, Okaloosa County, Florida. Later Gardner (1926, p. 1) raised this unit to a formation. Cooke (1945, p. 167) reduced the rank of Oak Grove again by including it in the Shoal River formation as its lower member on the assumption that there are greater faunal similarities between the Oak Grove and the Shoal River than has hitherto been realized, and because the known area of the Oak Grove sand is limited to the vicinity of its type locality. Since Oak Grove sand represents only a localized basal portion of the Shoal River facies, the writer has followed Cooke's usage of the term Oak Grove as a basal portion of the Shoal River facies.

The type locality of the Oak Grove facies is the abandoned site of an old saw mill near Oak Grove on the right bank of the Yellow River about 100 yards below the bridge on the Laurel Hill-Oak Grove road. Most of this locality is covered with saw dust and is now nowhere accessible. An auger hole (AS-233) was drilled on this site to obtain some type material and also to ascertain the exact thickness of the Oak Grove facies. The deposits referred to this facies by earlier workers have only been a few feet. It is therefore, interesting to note that the auger hole penetrated the Oak Grove facies at ten feet and the bit was still in the Oak Grove facies when the auger hole was completed at seventy-five feet. This would give the Oak Grove facies a minimum thickness of sixty-five feet. The following is the detailed log of AS-233:

	Feet
Plio-Pleistocene	
Brown sand (1 foot); greenish-gray clay (3 feet); white sand (1 foot)	0-5
Coarse white sand	5-10
Alum Bluff Stage—Oak Grove facies	
Medium-grained, greenish-gray, argillaceous sand	10-15
Same	15-75

The following foraminiferal species are known to occur only in the Oak Grove facies:

Asterigerina miocenica Cushman and Ponton

The following ostracode species have been found only in the Oak Grove facies:

Haplocytheridea okaloosensis (Stephenson)
Cytheretta gardneri Smith

The following species are common in the Chipola facies and the Oak Grove facies:

Quinqueloculina crassa d'Orbigny var.
Sigmomorphina pearceyi Cushman and Ozawa
Bolivina plicatella mera Cushman and Ponton
Amphistegina floridana Cushman and Ponton
Cycloloculina miocenica Cushman and Ponton

The following species are common to the Oak Grove facies and the Shoal River facies:

Bigenerina floridana Cushman and Ponton
Cytheromorpha dalli (Howe and Brown)
Paracytheridea shoalriverensis Puri, n.sp.

CHOCTAWHATCHEE STAGE

The Choctawhatchee Stage includes all Miocene sediments of post-Alum Bluff Age in the Florida panhandle and their equivalents in the Central and Western Gulf States. In the Florida panhandle, four biofacies, *Yoldia, Arca, Ecphora* and *Cancellaria* are recognized, see figures 2 and 3. These biofacies are considered to be faunizones within the Choctawhatchee formation. Type exposures of the Choctawhatchee formation are here designated as the type of the Stage.

The name Choctawhatchee marl was first used by Matson and Clapp (1909, p. 114) for the Miocene beds at John Anderson's farm, three-quarters of a mile east of Red Bay, Walton County, Florida, the upper shell bed at Alum Bluff and for similar deposits elsewhere. Choctawhatchee marl, as defined by Matson and Clapp, included the "*Ecphora* bed" and "aluminous clay" of Dall (Dall and Stanley-Brown, 1894, pp. 168-169). Mansfield (1916, pp. 599-607) described the outcrop at Red Bay and listed and described its molluscan fauna. Cooke and Mossom (1929, p. 138) referred to the unit as a formation rather than a "marl" because the marl beds constitute only a part of the formation and are less predominant than clay beds. Mansfield (in Cooke and Mossom, 1929, p. 140) recognized three faunizones: *Arca, Ecphora* and *Cancellaria* in the Choctawhatchee formation and designated the type faunizone at Red Bay as *Arca* faunizone, from *Arca rubisiniana* Mansfield—a common pelecypod occurring at that locality. A fourth, the *Yoldia* faunizone, was added to the original three faunizones by Mansfield and Ponton (1932, pp. 84-88). They gave the following generalized section of the Choctawhatchee:

	Feet
5. *Cancellaria* faunizone. Fine to coarse, clayey, fossiliferous sand	25-30
4. "Aluminous clay." Grayish, unfossiliferous clay	25
3. *Ecphora* faunizone. Sandy, fossiliferous clay	15-25
2. *Arca* faunizone. Gray, sandy, fossiliferous marl	55
1. *Yoldia* faunizone. Dark-gray to bluish, micaceous and carbonaceous, clayey, fossiliferous sand	15

Vernon (1942) after studying the sections in Washington and Holmes counties came to the conclusion that *Ecphora* and *Cancellaria* faunizones were the updip facies of the *Arca* and *Yoldia* faunizones. Cooke (1945), however, discarded the term Choctawhatchee and included the lower two faunizones, *Yoldia* and *Arca* in the Shoal River "formation" and the upper two faunizones, *Ecphora* and *Cancellaria* in the Duplin marl. In this report, *Yoldia, Arca, Ecphora* and *Cancellaria* faunizones are included in the Choctawhatchee Stage. Each of these faunizones represents a distinct biofacies.

Yoldia facies

The name *Yoldia* faunizone (from *Yoldia waltonensis* Mansfield) was first used by Mansfield and Ponton (1932, p. 86) for about fifteen feet of dark-gray to bluish, micaceous, sandy sediments exposed at Albert H. Cosson's farm (formerly Frazier's farm), located in the southeast-quarter of Section 18, Township 2 North, Range 19 West, Walton County, Florida. Mansfield and Ponton thought the faunizone represented the basal bed of the Choctawhatchee formation, supposedly overlying the Shoal River, but nowhere has its lower or upper contact been recognized with certainty. They thus justified the recognition of the *Yoldia* faunizone:

> "The zone is separated from the overlying *Arca* zone because of its abundant content of large *Yoldia* shells, a genus which usually indicates that the temperature of the water in which it lived was rather cold."

An auger hole (AS-231) was drilled at the type locality to ascertain the exact thickness of the *Yoldia* facies. The bit penetrated the *Yoldia* facies at ten feet and it was still in the *Yoldia* facies when the hole was completed at eighty-five feet. This would extend the thickness of the facies from about fifteen feet to at least seventy-five feet. The following is the log:

	Feet
Plio-Pleistocene	
Coarse brown sandy clay	0-5
Same	5-10
Choctawhatchee Stage—*Yoldia* facies	
Greenish-gray plastic clay	10-15
Same	15-35
Greenish-gray clay interbedded with sand	35-40
Same	40-50
Greenish-gray clay	50-85

The microfauna of the *Yoldia* facies in general consists of widely ranging forms and possibly represents a comparatively shallow water fauna. Its ostracode fauna is comprised of the following species:

Actinocythereis exanthemata (Ulrich and Bassler)
Puriana rugipunctata (Ulrich and Bassler)
Haplocytheridea bassleri Stephenson
Cytherideis fabula Howe and Dohm

The following foraminiferal species have been found only in the *Yoldia* facies:

Amphimorphina sp.
Nodogenerina advena Cushman and Laiming

Arca facies

The name *Arca* faunizone (from *Arca rubisiniana* Mansfield) was named for nineteen feet of gray, sandy and clayey, shell marl in the vicinity of Red Bay, Walton County, Florida, by Mansfield (Cooke and Mossom, 1929, pp. 140-142) and was designated the type zone for the Choctawhatchee formation. At the type locality, neither the top nor the bottom of the faunizone is exposed. Later, Mansfield and Ponton (1932, pp. 84-88) assigned twenty-one feet of sediments to this faunizone at the type locality. They estimated its total thickness to be about fifty-five feet. The upper limit of the faunizone at the type locality was provisionally placed by them at the contact of the gray marl with the overlying plastic clay bed, which they referred to the *Ecphora* faunizone. They also postulated an unconformity between the two beds because of the absence of fossils from the clay bed and the lithologic differences between the underlying marl and the overlying clay. Mansfield (1932) after a critical examination of the molluscan fauna, came to the conclusion that the molluscan fauna was closely related to that of the Shoal River facies from which its species were evolved. Such a relationship is also shown by the microfaunal evidence in a general way, but this apparent similarity is not very striking. The fauna of the *Arca* facies is definitely more allied with its contemporaneous *Ecphora* and *Cancellaria* facies than with the older Alum Bluff fauna.

An auger hole (AS-230) was drilled in the vicinity of Red Bay Fire Tower, in the northeast quarter, southwest quarter, northwest quarter, Section 15, Township 2 North, Range 17 West, Walton County, Florida. The auger penetrated the *Arca* facies at forty-four feet and the bit was still in the *Arca* facies when the hole was completed at eighty-five feet. At least forty feet of the *Arca* facies is exposed in a ravine nearby. The following is the detailed log of the bore hole:

Pleistocene	Feet
Coarse red sand	0-5
Same	5-10
Same	10-15
Yellowish-brown coarse sand with some pebbles	15-20
Yellowish-brown coarse sand with some pea size gravel	20-25
Same	25-30
Quartz sand with a yellowish clay matrix	30-35
Same	35-40
Same	40-44

Choctawhatchee Stage—*Arca* facies

Light gray to greenish plastic clay	44-50
Dark green clay and shell marl	50-55
Plastic greenish clay and shell marl	55-60
Same	60-85

Smith (1941, p. 269) proposed the name Permenter's Farm beds for the sediments that overlie the *Arca* facies in Walton County. The type locality is locality No. 23, which is an old road-cut on the east bank of Alaqua Creek, on Permenter's farm, Section 17, Township 1 North, Range 19 West, Walton County, Florida. These beds, which consist of about twenty-five feet of fossiliferous, gray marl, were assigned to the *Ecphora* faunizone by Mansfield (1932, p. 22), and Mansfield and Ponton (1932, p. 87). Cushman and Ponton (1936, p. 15) followed Mansfield and assigned those beds to the *Ecphora* faunizone. In doing so Cushman and Ponton were guided by the presence of *Virgulina (Virgulinella) gunteri* var. *curtata* Cushman and Ponton, a form that they thought was restricted to the *Ecphora* faunizone but which is now known to occur in the *Arca* facies as well. These beds, according to Smith (1941, pp. 272-273) are definitely younger than the *Arca* facies and contain six species "that have not been found elsewhere in Florida above the middle Miocene." These species are:

Saracenaria acutauricularis (Fichtel and Moll)
Dentalina consorbina var. *emaciata* Reuss
Buliminella curta Cushman
Valvulineria floridana Cushman
Anomocytheridea floridana (Howe and Hough)
Cytheretta burnsi (Ulrich and Bassler)

Smith (1941, p. 281) assigned these beds to a stratigraphic unit equal in rank with the *Arca* faunizone. The lower limit of this unit was thought by him to coincide with the first appearance of *Plectofrondicularia floridana* Cushman and *Siphogenerina lamellata* Cushman, and the upper limit to coincide with the first occurrence of *Bolivina marginata* var. *multicostata* Cushman and *Vulvulineria floridana* Cushman. Smith believed that the contained fauna represents a transition between the "middle" and "upper" Miocene. The validity of Permenter's Farm bed, which is strictly paleontologic in nature, is questioned because five of the six supposedly restricted species also occur in beds of undoubted *Arca* age and the sixth [*Saracenaria acutauricularis* (Fichtel and Moll)] is also known to occur in the Chipola formation. These beds are therefore included in the *Arca* facies and it is recommended that the term Permenter's Farm beds be dropped.

The following foraminiferal species have only been found in the *Arca* facies:

Massilina quadrans Cushman and Ponton var.
Flintina floridana Cushman and Ponton
Robulus floridanus (Cushman)
R. catenulatus (Cushman)
Plectofrondicularia floridana Cushman
Bulimina ovata d'Orbigny
Bolivina advena Cushman
Loxostomum gunteri Cushman
Siphogenerina lamellata Cushman
Chilostomella oolina Schwager
Discopulvinulina bertheloti (d'Orbigny)
Guttulina roemeri (Reuss)
Lagena clavata (d'Orbigny)
Nonionella cf. *N. turgida* (Williamson)
?*Coskinolina* sp.
Pullenia sp.
Eponides sp.
Bolivina n.sp. 1
Orthoplecta sp.

The following ostracode species are known to date only from the *Arca* facies:

Bairdia laevicula Edwards
Caudites sellardsi (Howe and Neill)
Cythere n.sp
Anomocytheridea floridana (Howe and Hough)
Cytheromorpha choctawhatcheensis Puri, n.sp.
Cytheretta burnsi (Ulrich and Bassler)
Eucytherura weingeisti Puri, n.sp.
Loxoconcha hendryi Puri, n.sp.
Paracytheridea vandenboldi Puri

The following ostracode species are common to the *Arca* facies of the Choctawhatchee Stage, and to the Alum Bluff Stage:

Basslerites tenmilecreekensis Puri, n.sp.
Actinocythereis exanthemata (Ulrich and Bassler)
Murrayina howei Puri, n. name
Cytherideis anderseni Puri
C. ulrichi Howe and Johnson
Loxoconcha alumbluffensis Puri, n.sp.
Cytheretta choctawhatcheensis Howe and Taylor

The following ostracode species are common between the *Arca* and the *Ecphora* and *Cancellaria* faunizones:

Basslerites miocenica Howe
B. cf. *B. giganticus* Edwards
Bythocypris howei Puri, n.sp.
Actinocythereis exanthemata marylandica (Howe and Hough)
Echinocythereis garretti (Howe and McGuirt)
Murrayina martini (Ulrich and Bassler)
Haplocytheridea choctawhatcheensis (Howe and Stephenson)
Cytheromorpha redbayensis Howe and Brown

Cytheropteron leonensis Puri, n.sp.
Cytherura wardensis Howe and Brown
Cytherelloidea moccasinensis Sexton
Eucythere triangulata Puri, n.sp.
Hemicythere conradi Howe and McGuirt
H. howei Puri
Kangarina quellita Coryell and Fields
Luvula palmerae Coryell and Fields
Pterygocythereis cornuta americana (Ulrich and Bassler)

Ecphora facies

The *Ecphora* "bed" named by Dall (1892) was later changed to *Ecphora* "zone" by Mansfield (1929). The type locality of the *Ecphora* faunizone is the upper shell bed at Alum Bluff on the east side of the Apalachicola River, about four miles north of Bristol, Liberty County, Florida, where the following section, measured just downstream from the classic exposure by Robert O. Vernon and Charles W. Hendry, Jr., on March 28, 1952 is exposed:[3]

Bed	Description	Thickness (feet)
Pleistocene Series—Coharie formation		
12	Sand, tan, medium quartz, brown-colored mottling with a carbonaceous soil zone at the top.	10.0
11	Clay, red, gray, yellow and orange variegated, sandy and blocky. The top gradually merges into bed 12. Makes a vertical wall.	2.5
10	Sand, medium to fine, poorly sorted quartz, brown to tan with brown mottled streaks, grades into beds 9 and 11	1.5
9	Sand, very coarse, loose quartz with pebbles of quartz at the base. Extremely cross-bedded near the top, changing upward into finer sand	18.0
8	Sand, yellow, brown and white mottled, coarse quartz containing pebbles of quartz and being irregularly cross-bedded.	9.0
7	Sand, as above but with scattered quartz and kaolinite pebbles.	6.25
Unconformity		
Miocene Series—Choctawhatchee Stage—*Ecphora* facies		
6	Sand, very argillaceous, red, yellow and gray variegated.	15.0
5	Clay, sandy, greenish-gray, micaceous with crystals and crusts of gypsum. Weathered surfaces are brown and contain sandy, limonitic nodules.	27.0
4	Sand, slightly argillaceous, carbonaceous, dark greenish-gray. Contains crystals of gypsum and rare, scattered molds of mollusks similar to those in bed 3. Gradational contact. Note the recent development of larva-chambers of a woods bee, along the steps cut into the bluff.	3.0
3	Shell marl, very sandy, blue and bluish-gray, practically a coquina. The upper six inches is very indurated and quite glauconitic. The bottom foot contains pebbles of gray, phos-	

[3]Mansfield (1930, 1932) lists 107 species of mollusks from the Choctawhatchee at Alum Bluff and Gardner (1926-1950) lists 131 species from the Chipola. Cushman (1930) lists 29 species of foraminifers from the Choctawhatchee and Cushman and Ponton (1932) record 45 species of foraminifers from bed 3 and 19 species from bed 1.

Bed	Description	Thickness
	phoritic, sandy limestone; gray sandstone; and blue clay. The marl has penetrated bed 2 along animal borings. This is the type locality of the *Ecphora* zone and mollusk shells are abundant.	13.5
Unconformity		
Alum Bluff Stage—Hawthorn facies		
2	Sand, argillaceous, calcareous, yellow, gray and white variegated, cross-bedded and thinly laminated in places. The top is very irregular, with many buried hills. The top foot is weathered and is cut by animal borings filled with shell marl above. The upper five feet is extremely cross-bedded, with brown and blue clay lenses. The base contains relatively unconsolidated masses of sand held between sand beds containing more clay in the matrix. (Basal four feet with abundant fossil leaves.)	16.0
Alum Bluff Stage—Chipola facies		
1	Sand, yellow to medium tannish-gray, calcareous marl containing numerous mollusk shells and an excellent microfauna.	4.0
Total thickness		125.75

The section described above is located downstream from that described in literature, but the succession of beds is the same.

The following foraminiferal fauna is known to date to occur only in the *Ecphora* facies:

Quinqueloculina contorta d'Orbigny
Spiroloculina depressa d'Orbigny
Marginulina dubia Neugeboren
Virgulina (*Virgulinella*) *gunteri curtata* Cushman and Ponton
Uvigerina parkeri Karrer
Massilina sp.

The following ostracode species have been found only in the *Ecphora* facies:

Echinocythereis evax (Ulrich and Bassler)
E. evax var. *oblongata* (Ulrich and Bassler)
Hemicythere confragosa Edwards
Kangarina jacksonbluffensis Puri, n.sp.
K. howei Puri, n.sp.
Loxoconcha caudata Puri, n.sp.
Paracytheridea washingtonensis Puri, n.sp.
Pellucistoma jacksonbluffensis Puri, n.sp.

The following foraminiferal species occur in *Ecphora* and *Arca* facies but not elsewhere in the Florida Miocene:

Spiroloculina dentata Cushman and Todd
Parafissurina bidens (Cushman)
Planispirillina orbicularis (Bagg)
Cassidulinoides bradyi (Norman)
Bulimina inflata Seguenza
Dentalina pyrula (d'Orbigny)

Robulus americanus spinosus (Cushman)
Nodosaria catesbyi d'Orbigny
Uvigerina auberiana d'Orbigny
Gümbelina sp.

Cancellaria facies

The *Cancellaria* faunizone (named after *Cancellaria propevenusta* Mansfield) is typically developed in the highest fossiliferous beds along Harveys Creek in the southwest quarter of Section 9, Township 1 South, Range 3 West, Leon County, Florida. The faunizone is composed of fine to coarse-grained, argillaceous sand and sandy shell marl and has an estimated thickness of 25 to 30 feet.

The following foraminiferal species have been found only in the *Cancellaria* facies:

Textularia floridana Cushman
T. foliacea occidentalis Cushman
Massilina gunteri Cushman and Ponton
Triloculina asperula Cushman
Nodosaria calomorpha Reuss
Lagena quadrata (Williamson)
Pyrulina albatrossi Cushman and Ponton
Elphidium incertum (Williamson)
Pavonina miocenica Cushman and Ponton
Robertina subteres (Brady)
Patellina corrugata Williamson
Rectocibicides miocenica Cushman and Ponton
Acervulina inhaerens Schultze

The following ostracode species have been found only in the *Cancellaria* facies:

Luvula moccasinensis Puri, n.sp.
Pellucistoma tumida Puri, n.sp.
Platella gatunensis Coryell and Fields

The following foraminiferal species occur in the *Ecphora* and *Cancellaria* facies and not elsewhere in Florida:

Amphistegina lessonii d'Orbigny
Textularia mayori Cushman
Oolina hexagona scalariformis (Williamson)
Lagena striato-punctata Parker and Jones
L. costata amphora Reuss
Guttulina costatula Galloway and Wissler
Pseudopolymorphina rutila (Cushman)
Virgulina fusiformis Cushman
Bolivina pulchella primitiva Cushman
B. plicatella Cushman
Milliammina cf. *M. fusca* (Brady)
Fissurina orbignyana lacunata (Burrows and Holland)
Parafissurina marginata (Walker and Jacob)
Marginulina dubia Neugeboren

The following ostracode species are known to occur only in the *Ecphora* and *Cancellaria* facies:

Bairdoppilata triangulata Edwards
Cativella navis Coryell and Fields
Cythere apalachicolensis Puri, n.sp.
Cytheromorpha warneri Howe and Spurgeon
Cytheropteron wardensis Puri, n.sp.
C. talquinensis Puri, n.sp.
C. choctawhatcheensis Puri, n.sp.
C. coryelli Puri, n.sp.
Cytherura bananaformis Coryell and Fields
Cytherura wardensis var.
Cytherelloidea leonensis Howe
Cytheretta sahnii Puri
Loxoconcha wilberti Puri, n.sp.
L. doryandae Puri, n.sp.
L. reticularis Edwards
L. purisubrhomboidea Edwards
Paracypris choctawhatcheensis Puri, n.sp.
Paracytheridea altila Edwards
Paradoxostoma (?) *delicata* Puri, n.sp.
Rectotrachyleberis cf. *R. macerata* (Stephenson).

HISTORY OF DEPOSITION

The greatest part, about 400 feet, of the type Miocene beds of Panhandle Florida are made up of sediments deposited in shallow marine (neritic) waters. The shallow-water origin of these deposits coupled with the seaward thickening of about 1000 feet indicates the occurrence of subsidence during deposition. The rate of sedimentation was not uniform because there were a series of transgressions and regressions of the sea which produced cyclic sedimentary units. The transgressions seem to have been rapid as is shown by several overlaps and disconformities. The regressions were slow. The slowness of such regressions resulted in the deposition of a greater proportion of the sediments during this phase of the cycle. The cyclic changes produced in the sediments by such transgressions and regressions are of horizontal as well as of vertical distribution. This has resulted in the grouping of sediments of similar lithology in belts that generally parallel the "bay line."

The sediments deposited during the Miocene in Panhandle Florida show that the shore line occupied different positions bordering the land mass at various times. Such positions resulted from the advance or retreat of the sea in its fluctuations. The retreat of sea coupled with uplift has resulted in the occurrence of successively younger marine formations in a seaward direction. That more continental areas are presently exposed than during late Tertiary time, is shown by the progressive seaward shift of the shore line as preserved on progressively younger marine Pleistocene terraces occurring in a direction toward the present strand line.

Marine transgression is the advance of marine water accompanied by a landward migration of the strand. A transgressive sea will embody in its overlap time various facies that will be reflected in its sediments and fossil fauna. As the sea invades land, its shore line will slowly encroach upon the land and this shifting of the shoreline will in turn result in the "time-stratigraphic climbing" of both sediments and faunal species updip. The resultant stratigraphic wedge with its pointed end landward will result in facies fauna that varies in time.

Marine regression is the retreat of marine water accompanied by a seaward migration of the strand. During regression the sea "laps off" older sediments, depositing younger sediments as it retreats, each succeeding sediment being younger than the underlying rocks; such a succession of sediments will naturally result in the exposure of progressively older beds in a landward direction. The terms "marine off lap" (Malkin and Echols, 1948) or "marine regressive overlap" (Grabau, 1924) have been used to embrace sediments deposited during the period of regression of sea.

Since regression is a later phase of transgression itself, both are interrelated and form a complete stratigraphic cycle. Marine overlap is transgressive in nature; younger sediments extend progressively farther landward. Marine offlap is regressive in nature; the sediments thus deposited are younger farther seaward. Both transgressive and regressive phases will eventually result in facies changes, the magnitude of which will depend on the time lapsed.

FACIES

Since changes in environment are clearly expressed by vertical and horizontal changes in both lithology and fauna, the term facies is here used as a subdivision within the three stages of the Miocene Epoch as proposed in this paper. Geographic patterns are less easily observed except in areas of continuous lines of borehole sections, see figure 3. Both lithofacies and biofacies can be easily recognized throughout the Miocene section. The number of facies that are recognized in this sense is a measure of the recurrence of similar conditions throughout geologic time; these are reflected in lithology as well as in fauna. Lithologically or faunally dissimilar components within the three stages recognized here are designated as facies since they occupy approximately the same time-stratigraphic position in the section and also interfinger with one another.

The detailed examination of the Miocene section shows that the lithologic and biologic patterns, resulting from shifts in time and space distribution of environments, coincide with the formational and faunizonal boundaries. It is apparent from stratigraphic sections of the Miocene of the Florida panhandle, (figures 2 and 3) that there are three well-developed stages, each bounded by an unconformity at both top and bottom: Tampa Stage, Alum Bluff Stage, and Choctawhatchee Stage.

TAMPA STAGE

Tampa seas were transgressive over the eroded surface of the Oligocene or older limestones. Early in this transgressive period a "limy" lithofacies (St. Marks) was deposited downdip, and late during this transgression and the regression that followed a more clastic (Chattahoochee) lithofacies was deposited updip. Both of these facies are gradational and this gradation is distinct. That Tampa seas were moderately shallow-warm is shown by fossil remains of genera like *Archaias, Peneroplis, Elphidium, Krithe* and *Clithrocytheridea*. The Chattahoochee facies was deposited nearer shore than the St. Marks facies. There is a slight time break between Tampa and Alum Bluff Stages. It is noticed in the vicinity of Willis on the Chipola River and in the vicinity of Carr on Tenmile Creek. An unconformity is apparent between the St. Marks and the Chipola sediments wherever exposed in this area. Tampa waters received more terrigenous material which was in places rapidly deposited without much sorting (Chattahoochee facies). The St. Marks facies was deposited under deeper water where precipitation of lime was in progress and only minor quantities of clastics, largely quartz sand, were being deposited. Some of the lime was later replaced by silica, thus giving rise to "Tampa silex beds."

ALUM BLUFF STAGE

"Middle Miocene" sediments of the Alum Bluff Stage were deposited unconformably on the Tampa. Alum Bluff Stage is divided into four lithofacies: Hawthorn, Chipola, Oak Grove and Shoal River.

Hawthorn facies

In the vicinity of Bailey's Ferry on the Chipola River, the Chipola facies lies unconformably on the top of the Chattahoochee. Also on Tenmile Creek, in the vicinity of Carr, the junction is unconformable, even though the top of the Chattahoochee does not appear to be eroded. Eastwards at Alum Bluff, on the Apalachicola River, sixteen feet of the Hawthorn lies unconformably on the Chipola and unconformably under 58.5 feet of the *Ecphora* zone of the Choctawhatchee. The Chattahoochee is not exposed here; hence its junction with the Chipola cannot be observed. At Rock Bluff, on the Apalachicola River, about seven and one-half miles north of Alum Bluff, ninety-two feet of Hawthorn sediments overlie the Chattahoochee unconformably.

It is apparent from the section at Rock Bluff and Alum Bluff: that the Chipola sea did not reach Rock Bluff since no definite marine Chipola sediments occur here between the Chattahoochee and the Hawthorn; that the Hawthorn thickens northwards from sixteen feet at Alum Bluff to ninety-two feet at Rock Bluff; that at least ten feet of marine sediments of Chipola age were deposited in the vicinity of Alum Bluff in a stratigraphic interval that is represented by eighty-six feet of deltaic and pro-deltaic Hawthorn deposits at Rock Bluff; that the locus of Hawthorn beds lies north of Rock Bluff; that the Hawthorn is contemporaneous with the Chipola and Shoal River facies; that at both top and bottom, the Hawthorn is marked by a distinct disconformity, erosional, at least in places.

The irregularity of the thickness of the Hawthorn is attributed to the deltaic and pro-deltaic nature of the sediments that fan out from the center of the Hawthorn delta (see Vernon, 1951, p. 184) and also due to erosional unconformities at its base and top (Vernon, 1951, pp. 180, 183)

Chipola facies

The transgressing Alum Bluff sea moving over the sediments of the Tampa Stage deposited a warm-water inner neritic Chipola fauna downdip. The Chipola fauna is a rather distinctive shallow-water fauna, that was laid down in inner neritic waters under stable conditions. Both the organic tests and the precipitation of calcium carbonate contributed to the calcareous nature of the sediments.

Shoal River facies

Updip the Alum Bluff sea deposited Shoal River facies under brackish-water conditions. The Shoal River sediments are predominantly sandy with some intervening shell marl beds. The fauna is typically brackish as is shown by the predominance of *Streblus beccarii, Elphidium gunteri, Anomocytheridea* sp., and *Perissocytheridea matsoni* among other brackish-water species.

Oak Grove facies

Oak Grove facies is a localized shallow marine to brackish-water, transgressive-regressive phase of the Alum Bluff sea. The Oak Grove sediments are mostly sandy and sparsely fossiliferous.

CHOCTAWHATCHEE STAGE

Choctawhatchee sediments were deposited unconformably on the rocks of Alum Bluff Age. These sediments are subdivided into four biofacies: *Yoldia, Arca, Ecphora* and *Cancellaria.*

Yoldia facies

Yoldia facies represents the westernmost shallow-water marine sediments of the Choctawhatchee Stage deposited in the vicinity of the type locality. It is represented by green argillaceous sands with abundant *Yoldia* and a sparse microfauna.

Arca facies

Sediments referred to *Arca* facies were deposited off shore under outer neritic conditions. These sediments are mostly gray, sandy shell marls. *Arca* facies in its lower portion is contemporaneous with the *Yoldia* facies but the upper portion is contemporaneous with the *Cancellaria* facies.

Ecphora facies

Ecphora facies was deposited under conditions similar to those of the *Arca* facies but the fauna is from deeper water. The sediments consist of shell marls deposited during the regression of the Choctawhatchee sea. The succeeding advance of the Choctawhatchee sea deposited the *Cancellaria* facies.

Cancellaria facies

Cancellaria facies is in part contemporaneous with the *Arca* and *Ecphora* facies and in part younger. The only known occurrence where the *Cancellaria* facies is known to overlie the *Ecphora* facies is in the vicinity of Jackson Bluff. The close of the Miocene time is marked by regression of the sea and subsequent subaerial erosion. Sands of Pliocene and Pleistocene age overlie the Miocene everywhere in the Florida Panhandle unconformably.

ECOLOGY

Interpretation of depositional environments of the Miocene of the Florida Panhandle is based on the comparisons of fossil assemblages with the Recent assemblages found in the sea bottom sediments. Since more than seventy per cent of the Miocene foraminiferal species are still living in the modern seas such a comparison is easier than it would be for assemblages that are almost totally extinct. Further evidence is drawn from various genera and species of the associated ostracode fauna and the lithology of these sediments.

ENVIRONMENTAL FACTORS

The basic concept of microfossils as environment indicators in sediments is a combination of several factors which control their habitat. Of the physical factors, perhaps the most important is the temperature of the water. Depth of the water runs a close second. Comparatively very little is known about the temperature at which the various assemblages would thrive or survive since more stress has been laid on the bathymetric control. Light conditions are usually closely related with the depth of water. The character of the bottom sediments plays an important role in supporting different benthonic assemblages. Movement of water by waves, currents and turbidity currents may result in transportation and the later deposition of a microfauna away from its natural habitat. Such a fauna will normally be of a very small percentage and will scarcely affect the dominant assemblages. Ellison (1951, p. 218) gives an excellent discussion of distribution of microörganisms and their remains.

Of the chemical factors that control the environments of microfossils salinity of water is perhaps the most significant. Thus certain forms will be truly marine; some of these could tolerate a slightly brackish water condition; and some brackish-water forms will even survive in fresh-water or vice versa. Little is known of the effect of chemical colloids, hydrogen ion concentrations, carbon

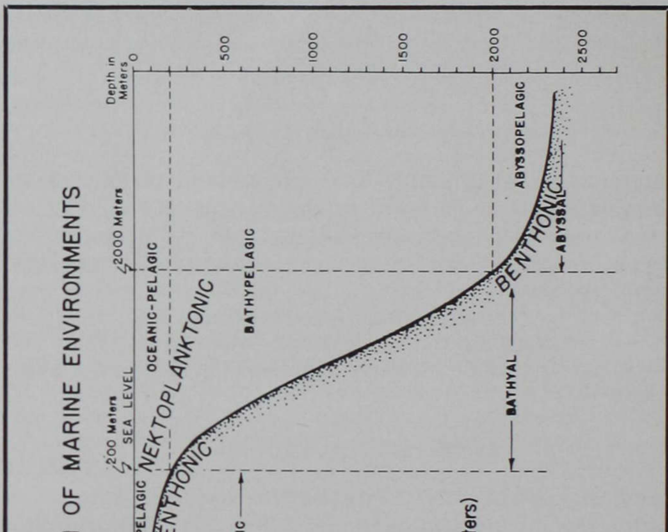


Figure 4
Classification of Marine Environments

dioxide, dissolved oxygen and nitrogen contents on the micro-fauna.

Of the biological factors, food is the chief element that affects the microfaunal population. An abundance of food, such as is available off the mouths of various rivers and is plentiful on the continental shelf, gives rise to a dense population. The degree of concentration of the life also plays an important role.

Classification of marine environments:

Figure 4, copied from National Research Council Committee on Marine Ecology and Paleoecology (Harry S. Ladd, Chairman), gives the present day standard terminology of the classification of marine environments as adopted by Ellison (1951, p. 216).

Two generalizations regarding the Foraminifera as environment indicators are:

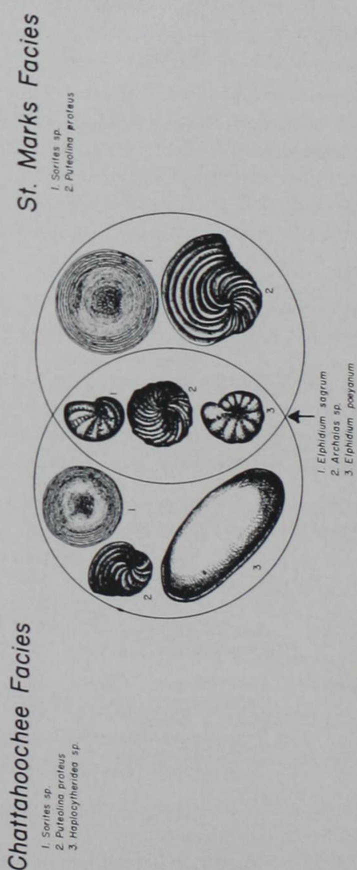
1. Benthonic microfossils are the chief indicators of depth, temperature and composition of water, because of their lack of mobility.
2. Pelagic (planktonic and nektonic) microfossils indicate only broad latitudinal boundaries of temperature and salinity because of their greater mobility which accounts for their greater distribution into a variety of sedimentary environments.

Norton (1930, pp. 331-338) examined thirteen samples, ranging in depth from beach to 2849 fathoms, from the Floridian and West Indian region. He divided the stations into four bathymetric zones depending on their depth and temperature.

Shallow water	Zone A.	Beach-5 fathoms Temperature range less than 21.5°-31.4°C
	Zone B.	5-60 fathoms Temperature range 18.9°-24.8°C
Intermediate depth	Zone C.	500-825 fathoms Temperature range 4.0°-7.61°C
Deep water	Zone D.	2000-2850 fathoms Temperature range 1.83°-2.0°C

Norton records the various foraminiferal types in these bathymetric zones and their relative abundance.

Lowman (1949, pp. 1957-8) made two profiles in the Gulf of Mexico, off the Pensacola and Choctawhatchee bays. Distribution of the foraminiferal genera plotted against one hundred per cent of assemblages is given in the form of a chart. Since Lowman did not identify the various species in his assemblages, a direct comparison with his investigations would be difficult without recalculating the percentages of the Miocene genera statistically.



Dominant and diagnostic assemblages of the Tampa Stage
Overlap of circles represents species common to both facies

Figure 5

PALEOECOLOGY OF THE FLORIDA MIOCENE

TAMPA STAGE

Preponderance of species of *Archaias, Sorites, Peneroplis, Elphidium, Krithe* and *Clithrocytheridea* suggest a warm (20°-30° C) inner neritic environment, see figure 5. Sediments of Chattahoochee facies were deposited still nearer shore. The fauna in general is meager in number of species but rich in individuals. *Sorites* and *Archaias* are very common throughout the Tampa Stage but they attain their maximum development in size in the calcareous St. Marks facies where some of the *Sorites* are almost an inch across.

ALUM BLUFF STAGE

The fauna of the Alum Bluff is mostly shallow water (inner neritic). The four lithofacies (Hawthorn, Chipola, Oak Grove and Shoal River) also exhibit distinct faunal assemblages which are reminiscent of their environmental conditions, see figure 6.

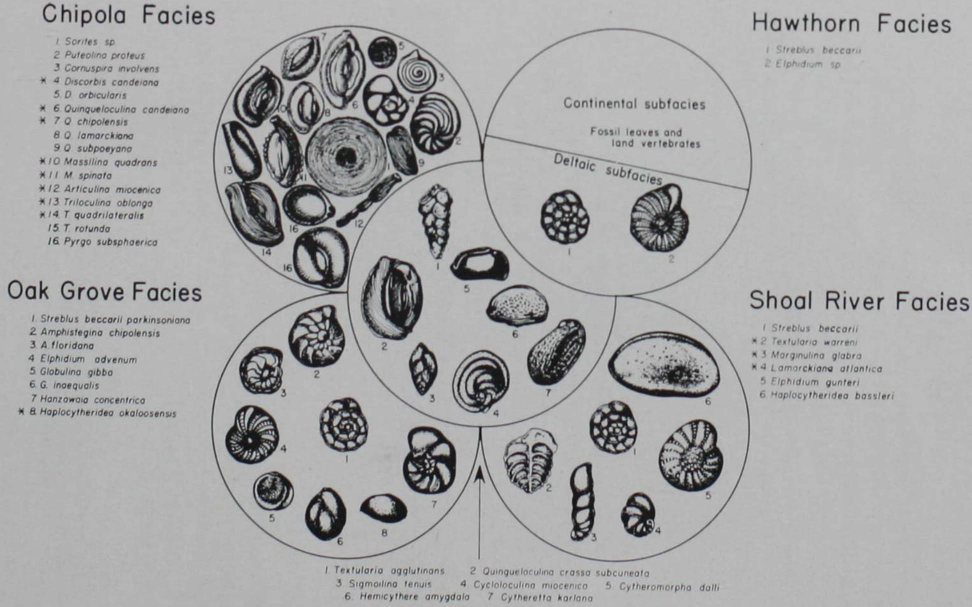
Hawthorn facies

Hawthorn facies in the Florida Panhandle was deposited under continental and deltaic environments. The continental sediments consist of medium to very coarse, cross-bedded sands which in places are leaf bearing (see section at Alum Bluff). The deltaic facies have yielded *Streblus beccarii* vars., and *Elphidium* sp.

Chipola facies

The sediments of the Chipola facies are calcareous, very similar to those being now deposited off the Floridian coasts. The sediments consist of both calcareous precipitates and organic skeletal aggregates. The Chipola microfauna is rich. The following miliolid species which form 33 per cent of the Chipola fauna are very common:

Quinqueloculina candeiana d'Orbigny
Q. crassa subcuneata Cushman
Q. chipolensis Cushman and Ponton
Q. lamarckiana d'Orbigny
Q. seminula (Linné)
Q. seminula var. Cushman
Q. subpoeyana Cushman
Spiroloculina sp. Cushman
Hauerina miocenica Cushman
H. cf. *H. fragilissima* (Brady)
Massilina incisa Cushman and Ponton
M. quadrans Cushman and Ponton



Dominant and diagnostic assemblages of the Alum Bluff Stage
Center circle represent diagnostic Alum Bluff species common between all three facies

* Characteristic species

Figure 6

M. spinata Cushman and Ponton
M. spinata glabrata Cushman and Ponton
Articulina advena (Cushman)
A. miocenica Cushman and Ponton
A. multilocularis (Brady, Parker and Jones)
Triloculina oblonga (Montagu)
T. quadrilateralis d'Orbigny
T. quadrilateralis longicostata Cushman and Ponton
T. rotunda d'Orbigny
Pyrgo subsphaerica d'Orbigny

The percentage of the species of the Miliolidae, found in the Chipola, to the total species and varieties in each sample conform with similar percentage found by Norton (1930, pp. 338-339) up to a depth of 60 fathoms. He did not find *Quinqueloculina candeiana*, *Q. lamarckiana*, *Spiroloculina depressa* d'Orbigny, *Hauerina* cf. *H. fragilissima* (Brady), *Triloculina rotunda* d'Orbigny, *T. quadrilateralis* d'Orbigny, *Pyrgo subsphaerica* d'Orbigny and *Articulina advena* (Cushman) outside his bathymetric zones A and B.

Out of four species of the Peneroplidae, found in the Chipola, three of these, *Puteolina proteus* (d'Orbigny), *Archaias* sp. and *Sorites* sp. are confined to shallow waters. Norton (1930, p. 346) recorded that *P. proteus* is, "closely restricted to the shallow warm waters and favors temperatures between 22° and 30° C." Species of *Archaias* and *Sorites* are at the present living in the warm shallow waters of the Floridian and West Indian region and range in depth up to 60 fathoms.

Cornuspira involvens Reuss, *Discorbis candeiana* d'Orbigny and *D. orbicularis* (Terquem), very abundant in the Chipola, are also known to be confined to a bathymetric range up to 60 fathoms.

It is evident that almost two-thirds of the foraminiferal species occurring in the Chipola facies are known to be living in the shallow warm waters of the present time and are generally restricted to a depth range of 60 fathoms. It is safe to assume that the bulk of the Chipola sediments were deposited at a depth of about 60 fathoms under warm (20°-30° C.) waters.

Shoal River facies

The dominant assemblage of the Shoal River facies is:

Textularia warreni Cushman and Ellisor
Marginulina glabra d'Orbigny
Streblus beccarii (Linné) vars.
Elphidium gunteri Cole
Haplocytheridea bassleri Stephenson

All of the species listed above are still living in the Florida

Panhandle bays. *Haplocytheridea bassleri,* which is very abundant in the Shoal River facies, is a brackish-water form (Stephenson, 1938, p. 135) and it dominates the modern bay microfauna. Shoal River facies are mostly brackish with a slight influx of inner neritic forms, which though not living in the modern bays, are represented by empty tests which are washed in the bays from the open sea at high tides.

Oak Grove facies

The dominant assemblage of the Oak Grove facies is:

Streblus beccarii parkinsoniana (d'Orbigny)
Amphistegina chipolensis Cushman and Ponton
A. floridana Cushman and Ponton
Elphidium advenum (Cushman)
Globulina gibba d'Orbigny
Globulina inaequalis Reuss
Hanzawaia concentrica (Cushman)
Haplocytheridea okaloosensis (Stephenson)

The tests of all the foraminiferal species listed above are common in the St. Andrews and Apalachicola bays and are associated with various species of *Haplocytheridea.* This fauna is indicative the Florida Panhandle, although some admixture of open marine of brackish-water conditions that now prevail in the inland bays of forms does exist.

CHOCTAWHATCHEE STAGE

Yoldia facies

The *Yoldia* facies fauna is inner neritic and the genus *Yoldia* is common in offshore muddy bottoms of modern seas. The dominant species occurring in the *Yoldia* facies are:

Nodogenerina advena Cushman and Laiming
Uvigerina peregrina Cushman
Epistomella pontoni (Cushman)
Virgulina miocenica Cushman and Ponton
Actinocythereis exanthemata (Ulrich and Bassler)
Puriana rugipunctata (Ulrich and Bassler)
Cytherideis fabula Howe and Dohm
Cytheretta spencerensis Smith

The paucity of miliolids coupled with the above assemblage would indicate a deeper water than Norton's (1930) zone B (5-60 fathoms). *Yoldia* facies is the updip equivalent of the *Arca* facies which seem to have been deposited in waters between 30 and 100 meters. Small changes in sea level would have resulted in the slight admixture of outer neritic species (i.e. *Uvigerina peregrina* Cushman) in the *Yoldia* facies. The rest of the assemblage is definitely inner neritic, see figure 7.

Arca facies

The fauna of the *Arca* facies is outer neritic. The following is the dominant assemblage:

Massilina quadrans Cushman and Ponton var.
Flintina floridana Cushman and Ponton
Plectofrondicularia floridana Cushman
Siphogenerina lamellata Cushman
Cancris sagra (d'Orbigny)
Discopulvinulina bertheloti (d'Orbigny)
Lagena clavulata (d'Orbigny)
Buccella mansfieldi (Cushman)
Virgulina (*Virgulinella*) *gunteri* Cushman
Bolivina marginata Cushman
B. marginata multicostata Cushman
B. floridana Cushman
Uvigerina advena Cushman
U. peregrina Cushman
U. auberiana d'Orbigny
Bulimina elongata d'Orbigny
Buliminella elegantissima (d'Orbigny)
Nonion grateloupi (d'Orbigny)
N. pizarrensis Berry
Chilostomella oolina Schwager

This assemblage would indicate a depth of more than 60 fathoms, with miliolid species less than ten per cent. The minimum depth range of *Discopulvinulina bertheloti* (d'Orbigny) is 30 meters, that of *Uvigerina peregrina* Cushman is 50 meters, that of *Chilostomella oolina* Schwager is 90 and 120 meters, optimum depth range of *Bulimina elegantissima* d'Orbigny is 80 meters. (Phleger, 1951, pp. 40, 46, 49, 57). The occurrence of the above species would indicate a minimum depth of 30 meters for the above assemblage. *Nonion grateloupi* d'Orbigny has a maximum depth range of 120 to 220 meters but is characteristic of depths less than 100 meters (Phleger, 1951, p. 47). The *Arca facies* would thus appear to have been deposited in outer neritic waters at a minimum depth range of 30 and a maximum depth range of less than 100 meters.

Ecphora facies

The fauna of the *Ecphora* facies is outer neritic. The following is the dominant assemblage:

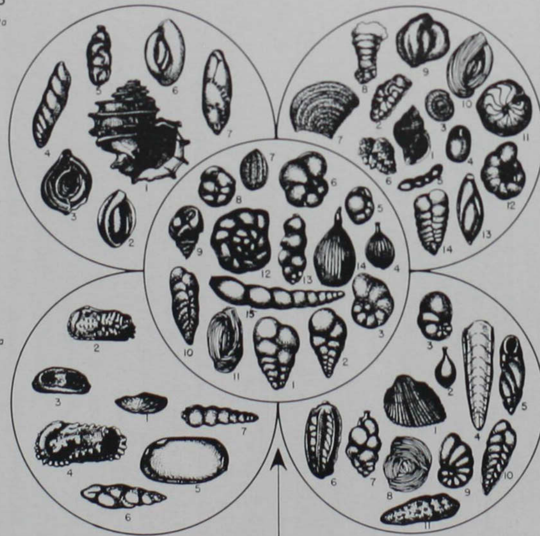
Amphistegina lessonii d'Orbigny
Textularia mayori Cushman

Ecphora Facies

1. Ecphora quadricostata umbilicata
2. Quinqueloculina contorta
3. Spiroloculina depressa
4. Marginulina dubia
5. Uvigerina parkeri
6. Massilina sp.
*7. Virgulina (Virgulinella) gunteri

Cancellaria Facies

*1. Cancellaria propevenusta
*2. Acervulina inhaerens
*3. Patellina corrugata
*4. Lagena quadrata
*5. Nodosaria calomorpha
*6. Textularia foliacea occidentalis
*7. Pavonina miocenica
*8. Rectocibicides miocenica
*9. Triloculina asperula
*10. Massilina gunteri
11. Amphistegina lessonii
12. Elphidium incertum
*13. Pyrulina albatrossi
*14. Textularia floridana



Yoldia Facies

*1. Yoldia waltonensis
2. Favella rugipunctata
3. Cytherideis fabula
4. Actinocythereis exanthemata
5. Cytheretta spencerensis
6. Virgulina miocenica
*7. Nodogenerina advena

Arca Facies

*1. Arca rubisiniana
*2. Lagena clavata
3. Cancris sagra
*4. Plectofrondicularia floridana
5. Buliminella elegantissima
*6. Siphogenerina lamellata
7. Uvigerina auberiana
*8. Flintina floridana
9. Nonion grateloupi
10. Bolivina marginata
11. Bolivina floridana

1. Textularia gramen
2. Textularia candeiana
3. Valvulineria floridana
4. Lagena sulcata
5. Cassidulina crassa
6. Globorotalia menardii
7. Lagena hexagona
8. Cassidulina laevigata
9. Bulimina marginata
10. Bolivina marginata multicostata
11. Quinqueloculina costata
12. Buccella mansfieldi
13. Angulogerina occidentalis
14. Lagena substriata
15. Dentalina communis

Dominant and diagnostic assemblages of the Choctawhatchee Stage
Center circle represents diagnostic Choctawhatchee species common among all four facies.

* Characteristic species

Figure 7

Quinqueloculina contorta d'Orbigny
Spiroloculina depressa d'Orbigny
Marginulina dubia Neugeboren
Virgulina (Virgulinella) gunteri curtata Cushman and Ponton
Bolivina pulchella primitiva Cushman
B. plicatella Cushman
Uvigerina parkeri Karrer
U. auberiana d'Orbigny
Planispirillina orbicularis (Bagg)
Cassidulinoides bradyi (Norman)
Bulimina inflata Seguenza
Dentalina pyrula (d'Orbigny)
Robulus americanus spinosus (Cushman)
Nodosaria catesbyi d'Orbigny

Textularia mayori Cushman and *Bolivina pulchella primitiva* Cushman are restricted to depths less than 100 meters (Phleger, 1951, p. 49). The presence of these species would indicate a maximum depth of 100 meters for the *Ecphora* assemblage.

Cancellaria facies

The fauna of the *Cancellaria* facies is very similar to that of the *Ecphora* facies. There are fifteen foraminiferal species and twenty-two ostracode species that are common between the *Ecphora* and *Cancellaria* facies and do not occur elsewhere in the section. These species include *Textularia mayori* Cushman, *Amphistegina lessonii* d'Orbigny, *Bolivina pulchella primitiva* Cushman, among other forms that have been listed before. *Amphistegina lessonii* d'Orbigny, abundant in the *Cancellaria* facies, forms as much as forty-four per cent of an anomalous "*Amphistegina* fauna" found in the present ocean at a depth of 128 meters (Phleger, 1951, p. 76). Norton (1930, p. 352) reports the species from seven samples ranging in depth from beach to 60 fathoms. *Textularia foliacea occidentalis* Cushman, common in the *Cancellaria* facies, is not known to occur in waters less than 32 meters deep but is characteristic of many faunas at 200 meters (Phleger, 1951, p. 49). The lower part of the *Cancellaria* fauna was deposited at about the same depth as the *Ecphora* fauna but its upper portion, which overlies the *Ecphora* facies at Jackson Bluff, was deposited under more shallow conditions during a transgressive sea.

Correlation with the Central and Western Gulf States

TAMPA STAGE

Chickasawhay Limestone and Paynes Hammock Sand

Chickasawhay ("upper" and "lower") of Wayne County, Mississippi, have their type localities in Wayne County.[4] Originally, both upper and lower units were referred to the Miocene, but Mansfield (1937) indicated that the lower Chickasawhay carried the fauna of the Suwannee limestone, and the upper Chickasawhay the mollusks of the Tampa. MacNeil (1944) replaced the lower Chickasawhay with the name Chickasawhay limestone, and called the upper Chickasawhay the Paynes Hammock sand.

Paynes Hammock sand, type locality Paynes Hammock, Section 16, Township 5 North, Range 2 East, Alabama, was first described by MacNeil (1944). It is definitely correlated with the St. Marks and the Chattahoochee facies of Florida, and is of Tampa Age. MacNeil considered it to lie at the base of the Catahoula sandstone, and to grade into the Catahoula sandstone and overlap the older Oligocene sediments in western Mississippi and Louisiana. Paynes Hammock sand is correlated with the lower part of the Catahoula by the Mississippi Geological Society (1948) and placed in the "lower" Miocene.

The Foraminifera and Ostracoda of the Paynes Hammock sand are given in checklists in the Guidebook of the Eleventh Annual Field Trip of the Shreveport Geological Society (1934). These checklists and plates are reproduced in the Guidebook of the Sixth Field Trip of the Mississippi Geological Society (1948). Many species are entirely undescribed. Two guide Foraminifera described from the "Chickasawhay" by Ellis (1939, pp. 423-424) are *Cibicides hazzardi* (Paynes Hammock sand) and *Nodosaria blanpiedi* (Chickasawhay limestone). These two species are used as guide fossils for horizons in the so-called "Marine Frio" which the Texas geologists consider to be Oligocene. *Cibicides hazzardi* probably should be considered Miocene, however, as it occurs in Tampa equivalents.

Catahoula Sand

Catahoula sand (type locality, Catahoula Parish, Louisiana) was named by Veatch (1906, pp. 42-43). About 1,000 feet of section is reported on the surface in Catahoula and LaSalle parishes, but it becomes much thicker to the south in wells. Best reference to sections of Catahoula from the outcrop southward is given by Fisk (1940). From this report, and from the Mississippi Geological Society Sixth Field Trip Guidebook, it may be seen that the *Heterostegina* zone of the subsurface appears in wells as much as

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[4]*Guidebook*, Shreveport Geol. Society, 11th Ann. Field Report (1934).

2,000 feet above the base of the Catahoula. The Catahoula is composed of essentially deltaic sands and clays on the surface in Louisiana, but it becomes entirely marine downdip.

Anahuac Formation

Anahuac formation (type locality, in the subsurface of the area of the Anahuac field of Chambers County, Texas) was named by Ellisor (1940) as a substitute for the older so-called "middle Oligocene" zones. It is strictly a subsurface formation in Texas and Louisiana.

Table 2

FAUNIZONES IN THE SUBSURFACE EQUIVALENTS OF THE CATAHOULA (FRIO AND ANAHUAC)*

Stage	Group	Faunal Zone	Distinctive Fossil
TAMPA	CATAHOULA	*Discorbis* zone**	*Discorbis* (large), *Discorbis gravelli, D. nomada, Eponides* and beaded *Robulus*
		Heterostegina zone	*Heterostegina israelskyi* *Heterostegina texana*
		Bolivina perca zone	*Bolivina perca*
		Marginulina idiomorpha vaginata zone	*Marginulina idiomorpha, M. mexicana* var. *vaginata*
		Marginulina howei zone	*Marginulina howei*
		"*Camerina*" zone	"*Camerina*" sp.
		Cibicides hazzardi zone	*Cibicides hazzardi*
		Marginulina texana zone	*Marginulina texana*
		Hackberry faunal assemblage	*Ammobaculites nummus, Gyroidina scalata, Bulimina sculptilis, Bolivina mexicana, Bolivina alazanensis*
		Nonion struma zone	*Nonion struma*
Chickasawhay Oligocene		*Nodosaria blanpiedi* zone	*Nodosaria blanpiedi*

*Modified after South Louisiana Geological Society, Geological Names and Correlation Committee, 1944-1945.

***Marginulina ascenionensis* Howe and McDonald, described from the Sorrento Dome, has become a zone fossil and is used in place of the *Discorbis* in the area east of the Mississippi River.

The Discorbis, Heterostegina, and Marginulina faunizones

These were originally described from well samples by Applin, Ellisor and Kniker (1925) and referred to "middle Oligocene" on the basis of an erroneous determination of the *Heterostegina ostegina* as *H. antillea*, a middle Oligocene species on the Island of Antigua, British West Indies. The *Heterostegina* encountered in this section have since been described as two species *H. texana* and *H. israelskyi* by Gravell and Hanna (1937). The sediments bearing these faunas were those named the Anahuac formation by Ellisor. The *Marginulina* referred to by Applin, Ellisor and Kniker was originally called *M. philippinensis*, a Recent species from the western Pacific. Garrett and Ellis (1937) studied the specimens of *Marginulina* of the lower 1,500 feet to 2,000 feet of this section and described a number of species, each of which marks a separate horizon. This makes possible a finer zonation of the section.

The Foraminifera of the Anahuac formation are likewise only partially described in papers by Applin, Ellisor and Kniker (1925), Gravell and Hanna (1937), Garrett and Ellis (1937), Garrett (1939), and Ellisor (1940, 1944). Ellisor (1944) reproduced the plates from the above cited papers and listed the following species from the Anahuac:

Marginulina *faunizone species*

Marginulina vaginata Garrett and Ellis	(Characteristic species)
Marginulina howei Garrett and Ellis	
Eponides ellisorae Garrett	(present with the species of the *Heterostegina* and *Discorbis* zones)
Robulus lacerta Garrett	
Bolivina perca Garrett	
Cibicides moreyi Garrett	
Discorbis gravelli Garrett	

Heterostegina *faunizone species*

Heterostegina texana Gravell and Hanna
H. israelskyi Gravell and Hanna
Operculinoides ellisorae Gravell and Hanna
O. howei Gravell and Hanna
Lepidocyclina colei Gravell and Hanna
L. texana Gravell and Hanna
Discorbis gravelli Garrett
Gyroidina vicksburgensis hannai Garrett
Eponides ellisorae Garrett
Textularia mornhinvegi Garrett
Vulvulina ignava Garrett
Marginulina idiomorpha Garrett
Robulus lacerta Garrett
R. chambersi Garrett
Bolivina perca Garrett
Uvigerina israelskyi Garrett
Bifarina vicksburgensis monsouri Garrett

Discorbis *faunizone species*

Discorbis gravelli Garrett
D. subauracana dissona Cushman and Ellisor
D. nomada Garrett
Siphonina davisi Cushman and Ellisor
Textularia teasi Cushman and Ellisor
Virgulina exilis Cushman and Ellisor
Robulus chambersi Garrett
Uvigerina howei Garrett
Lenticulina jeffersonensis Garrett
Bifarina vicksburgensis monsouri Garrett
Siphogenerina fredsmithi Garrett
Cibicides moreyi Garrett
C. jeffersonensis Garrett
Gyroidina vicksburgensis hannai Garrett
Uvigerina pilulata Cushman and Ellisor

ALUM BLUFF STAGE

MARINE FAUNIZONES

Uvigerina lirettensis faunizone

Uvigerina lirettensis faunizone was described by Ellisor (1940) and is characterized by the presence of *Uvigerina lirettensis* Cushman and Ellisor. It contains an abundant fauna, most species of which have been described from the *Arca* faunizone or the Shoal River formation of Florida.

The Harang Fauna

This is an offshore fauna first discovered on the Valentine Dome of LaFourche Parish, and is now known to be present on many other domes in coastal Louisiana in the subsurface. It is a very large fauna and has been described in detail by Pope and Smith (1949). It is easily recognized by the presence of *Planulina harangensis, Bolivina harangensis, Cibicides carstensi, Textularia tatumi,* etc., but carries also species that are characteristic of the Florida Alum Bluff Stage.

Numerous faunizones have been mentioned in the literature of of Texas and Louisiana for brackish and marine sediments of Alum Bluff Age and Choctawhatchee Age. The following are the latest papers: Stephenson (1935), Howe and McGuirt (1936, 1938), Ellisor (1940), Mincher (1941) and Pope and Smith (1949).

BRACKISH FAUNIZONES

Potamides matsoni faunizone

This faunizone is described from a hand-dug well some six miles

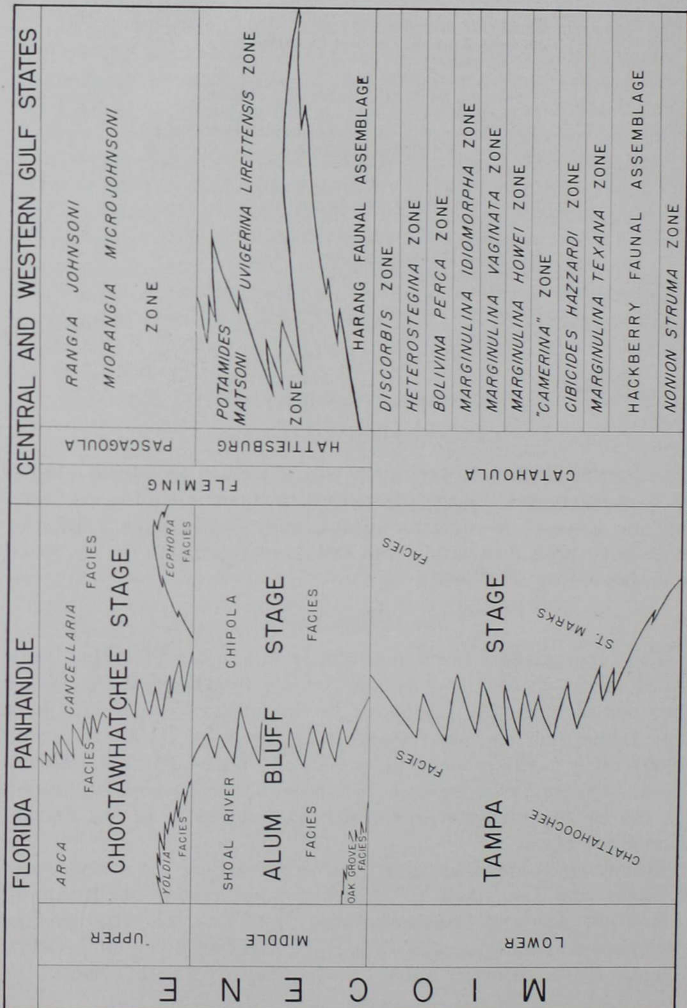


Table 3
Correlation of Miocene Section of the Florida Panhandle with the Western and Central Gulf States

southwest of Alexandria, Louisiana. Dall (1913) described the Mollusca present in this faunizone and the microfossils were described by Stephenson (1935) who listed:

Foraminifera

[*Streblus*] *beccarii* (Linné)
[*Streblus*] *beccarii* var. cf. *tepida* (Cushman)
Elphidium incertum (Williamson)
Eponidella cushmani Stephenson

Ostracoda

Anomocytheridea locketti Stephenson
Perissocytheridea matsoni Stephenson
Microcythere? moresiana Stephenson

Some of the brackish fossils of this faunizone have been found in the type Shoal River at Shell Bluff, Florida, and it is definite that they are of Alum Bluff Age.

CHOCTAWHATCHEE STAGE

Rangia johnsoni-Miorangia microjohnsoni faunizone

In the northern portion of the subsurface belt of Miocene sediments, the youngest sediments bearing a fauna are brackish and carry *Rangia johnsoni;* or its subsurface equivalent *Miorangia microjohnsoni,* a somewhat similar but somewhat smaller clam; oysters; and a small microfauna described by Mincher (1941) from the type Pascagoula formation.

Mincher (1941, p. 341) lists the following from this faunizone:

Foraminifera

Discorbis sp.
[*Streblus*] *beccarii* (Linné)
Elphidium gunteri Cole
Eponidella cushmani Stephenson

Ostracoda

Anomocytheridea ovata Mincher
Perissocytheridea matsoni Stephenson
Microcythere moresiana Stephenson
M. johnsoni Mincher
Cytheromorpha pascagoulensis Mincher

The ostracodes are more distinctive than the foraminifers and in many samples are more abundant.

Near the coast these sediments become marine, and brackish water and marine lenses interfinger in the area below New Orleans. The marine portion carries an *Ecphora-Cancellaria* faunizone fauna, although Mincher thought it to be the equivalent at least of the *Arca* faunizone.

LOCALITIES

Listed below are the localities from which samples used were collected. This list is divided into three parts. All locations of outcrop samples are listed in chronological order; references to locations contained in the text are indicated by the index number which precedes each entry. Florida Geological Survey accession numbers appear in parentheses after each auger and well section. The locality map (figure 1) shows their exact location.

OUTCROP SAMPLES

Alum Bluff Stage

1. Chipola facies. NE-¼ NE-¼, Sec. 20, T. 1 N., R. 16 W., Washington County, Florida.
2. Chipola facies. SE-¼ SE-¼, Sec. 8, T. 3 N., R. 16 W., Chimney Quarry, Washington County, Florida.
3. Chipola facies. SE-¼ SE-¼, Sec. 5, T. 1 N., R. 16 W., Washington County, Florida.
4. Chipola facies. One mile below Scott's Bridge, NE-¼, Sec. 27, T. 2 N., R. 12 W., Bay County, Florida.
5. Chipola facies. In a ravine 200 yards east of Holmes Creek, NW-¼ NE-¼, Sec. 28, T. 2 N., R. 16 W., Washington County, Florida.
6. Chipola facies. Two hundred and twenty yards below Walsingham Bridge, NE-¼, Sec. 15, T. 1 N., R. 13 W., Washington County, Florida.
7. Chipola facies. One mile above Gainer's Bridge, NW-¼, Sec. 34, T. 1 N., R. 13 W., Washington County, Florida.
8. Chipola facies. One and three-quarters miles below Scott's Bridge, over Econfina Creek, NE-¼, NW-¼, Sec. 28, T. 2 N., R. 12 W., Bay County, Florida.
9. Chipola facies. At Red Head Still, NE-¼, NW-¼, Sec. 20, T. 2 N., R. 16 W., Washington County, Florida.
10. Chipola facies. Lassiter Landing on Choctawhatchee River, SE-¼ SE-¼, Sec. 13, T. 2 N., R. 17 W., Washington County, Florida.
11. Chipola facies. Tenmile Creek, 2,376 feet of NW/cor., Sec. 12, T. 1 N., R. 10 W., four miles south of Willis, Calhoun County, Florida.
12. Type Chipola facies. Tenmile Creek, from Bridge to one-half mile below bridge on the Marianna-Clarksville Road, 2,376 feet south of NW/cor., Sec. 12, T. 1 N., R. 10 W., twenty-two miles south of Marianna, Calhoun County, Florida.
13. Chipola facies. NE-¼ SW-¼, Sec. 28, T. 2 N., R. 16 W., Washington County, Florida.
14. Chipola facies. SW-¼ NE-¼, Sec. 31, T. 2 N., R. 16 W., Washington County, Florida.
15. Oak Grove facies. At old saw mill near Oak Grove, on right bank of Yellow River, 300 feet south of NW/cor. of NE-¼ NE-¼, Sec. 20, T. 5 N., R. 23 W., about 100 yards below bridge on Laurel Hill-Oak Grove Road, Okaloosa County, Florida.
16. Oak Grove facies. Senterfeit's or Tanner's Mill (abandoned), Sec. 14, T. 5 N., R. 23 W., 4 miles southwest of Laurel Hill, Okaloosa County, Florida.
17. Shoal River facies. Small gully, 50 feet south of road and 150 feet east of bridge over White's Creek on Eucheeanna-Knox Hill Road, NE-¼ SE-¼ SW-¼, Sec. 23, T. 2 N., R. 18 W., one mile west of Valley Church, Walton County, Florida.
18. Shoal River facies. Small branch, one-fourth mile southeast of residence of J. T. G. McClellan, SE-¼ NW-¼, Sec. 4, T. 3 N., R. 21 W.,

about three-eighths mile west of Shell Bluff on Shoal River, Walton County, Florida.

19. Shoal River facies. Bottom of old fluorspar prospect shaft at a depth of 50 to 55 feet, about four and one-half miles south of Argyle, Walton County, Florida.
20. Shoal River facies. Under bridge over Shoal River, approximately two and three-quarters miles north of Mossyhead, SE/cor. of Sec. 35, T. 4 N., R. 21 W., Walton County, Florida.

Choctawhatchee Stage

21. *Yoldia* facies. Albert H. Cosson's farm (formerly Frazier's farm), SE-¼, Sec. 18, T. 2 N., R. 19 W., Walton County, Florida.
22. *Yoldia* facies. Chester Spence farm, NE-¼ NE-¼, Sec. 17, T. 2 N., R. 19 W., Walton County, Florida.
23. *Arca* facies. Road cut leading to an abandoned bridge on east bank of Alaqua Creek on Permenter's farm, Sec. 17, T. 1 N., R. 19 W., Walton County, Florida.
24. *Arca* facies. W. E. Collin's farm, SE-¼ NE-¼, Sec. 15, T. 2 N., R. 15 W., Washington County, Florida.
25. *Arca* facies. SW-¼ NE-¼ SW¼, Sec. 16, T. 2 N., R. 15 W., Washington County, Florida.
26. *Arca* facies. NW-¼ SE-¼, Sec. 16, T. 2 N., R. 15 W., spring head, 100 yards east of road, Washington County, Florida.
27. *Arca* facies. SW-¼ NW-¼, Sec. 15, T. 2 N., R. 15 W., Washington County, Florida.
28. *Arca* facies. SE-¼ SW-¼ NE-¼, Sec. 15, T. 2 N., R. 15 W., Washington County, Florida.
29. *Arca* facies. NW-¼ SW-¼, Sec. 15, T. 2 N., R. 15 W., Washington County, Florida.
30. *Arca* facies. NE-¼ SW-¼, Sec. 16, T. 2 N., R. 15 W., Washington County, Florida.
31. *Arca* facies. Flournoy's old mill, NE-¼ NE-¼, Sec. 34, T. 3 N., R. 18 W., Holmes County, Florida; at an elevation of 164 feet.
32. *Arca* facies. In a steep head in SW-¼ NE-¼ SW-¼, Sec. 16, T. 2 N., R. 15 W., along a small ravine running west into Southside Branch, Washington County, Florida.
33. *Arca* facies. Jim Kennedy Branch, Sec. 8, T. 2 N., R. 17 W., west of Red Bay, Walton County, Florida.
34. *Arca* facies. John Anderson's farm, Sec. 10, T. 2 N., R. 17 W., three-fourths mile east of Red Bay, Walton County, Florida.
35. *Arca* facies. At small spring head in E. Gomillion's field near Red Bay, 900 feet west of center of Sec. 9, T. 2 N., R. 17 W., Walton County, Florida.
36. *Ecphora* facies. Pit of West Florida Power Company, just east of road at Power Dam, being about 300 feet east of the hydroelectric power plant near Ward, Liberty County, Florida.
37. *Ecphora* facies. Three hundred feet above Walsingham Bridge over Econfina Creek, NE-¼, Sec. 15, T. 1 N., R. 13 W., Washington County, Florida.
38. *Ecphora* facies. One-fourth mile above Walsingham Bridge, SW-¼, Sec. 11, T. 1 N., R. 13 W., Washington County, Florida.
39. *Ecphora* facies. One-fourth mile above Walsingham Bridge, SE-¼, Sec. 10, T. 1 N., R. 13 W., Washington County, Florida.
40. *Ecphora* facies. Two hundred and twenty yards above Walsingham Bridge, Econfina Creek, NE-¼, Sec. 15, T. 1 N., R. 13 W., Washington County, Florida.
41. *Ecphora* facies. Jackson Bluff, near top of section, Ochlockonee River, Leon County, Florida.
42. *Ecphora* facies. Jackson Bluff, top shell bed, Ochlockonee River, Leon County, Florida.
43. *Ecphora* facies. *Pecten* bed, Jackson Bluff, Ochlockonee River, Leon County, Florida.

44. *Ecphora* facies. Jackson Bluff, Ochlockonee River, Leon County, Florida.
45. *Ecphora* facies. Upper shell bed at Alum Bluff on the east bank of the Apalachicola River, S-½ NE-¼, Sec. 24, T. 1 N., R. 8 W., about four miles north of Bristol, Liberty County, Florida.
46. *Ecphora* facies. Cut in road leading to Watson's Landing, about two miles north of Alum Bluff and about the same distance from the Apalachicola River, 2,000 feet N. and 100 feet W. of SE/cor. of Sec. 7, T. 1 N., R. 7 W., Liberty County, Florida.
47. *Ecphora* facies. Harvey Creek, one-half mile above old well at "swimming hole," five feet below water, Leon County, Florida.
48. *Cancellaria* facies. Gully Pond, southeast of Greenhead, on the Sales-Davis Lumber Company property, in the center of N-½, NW-¼ NE-¼, Sec. 14, T. 1 N., R. 14 W., Washington County, Florida; at an elevation of approximately 59 feet.
49. *Cancellaria* facies. One mile below Walsingham Bridge over Econfina Creek, NW-¼ SW¼, Sec. 11, T. 1 N., R. 13 W., Washington County, Florida.
50. *Cancellaria* facies. One-quarter mile below Gainer's Bridge, Econfina Creek, SW-¼ SE-¼, Sec. 33, T. 1 N., R. 13 W., Washington County, Florida.
51. *Cancellaria* facies. Borrow pit just east of the power dam at Jackson Bluff, on Ochlockonee River, 500 feet east of NW/cor., Sec. 21, T. 1 S., R. 4 W., Leon County, Florida.
52. *Cancellaria* facies. NE-¼, Sec. 16, T. 1 S., R. 13 W., on Moccasin Creek, beneath bridge, Bay County, Florida.
53. *Cancellaria* facies. Blue Sink, corner of NE-¼, Sec. 14, T. 1 N., R. 14 W., Washington County, Florida.
54. *Cancellaria* facies. Three-eighths mile above Gainer's Bridge on Econfina Creek, NE-¼, Sec. 33, T. 1 N., R. 13 W., Washington County, Florida.
55. *Cancellaria* facies. One-half mile above Gainer's Bridge on Econfina Creek, SE-¼ NE-¼, Sec. 33, T. 1 N., R. 13 W., Washington County, Florida.
56. *Cancellaria* facies. In a small stream south of and under Gainer's Bridge in the SW-¼ SE-¼, Sec. 33, T. 1 N., R. 13 W., Washington County, Florida.
57. *Cancellaria* facies. In a small sink south of a community road in the NW-¼, SW-¼, Sec. 7, T. 1 N., R. 13 W., Washington County, Florida.
58. *Cancellaria* facies. Clarke's Pond, NE-¼, SE-¼, SW-¼, Sec. 12, T. 1 N., R. 12 W., Washington County, Florida.

AUGER HOLE SECTIONS

1. (AS-111) James Rogers Fishing Camp, NE-¼ NW-¼ NE-¼, Sec. 11, T. 1 N., R. 14 W., Washington County, Florida; at an elevation of 73.17 feet. Total depth reached 69 feet.
2. (AS-112) NW-¼ SE-¼ SW-¼, Sec. 7, T. 1 N., R. 13 W., at USC&GS BM TT-20-C 1942, at outcrop in Deadening Lakes, Washington County, Florida; at an elevation of 63 feet. Total depth reached 44 feet.
3. (AS-113) At Mr. Brock's house in SE-¼ NW-¼ SE-¼, Sec. 8, T. 1 N., R. 14 W., just south of Crystal Lake Post Office, Washington County, Florida; at an elevation of 140.65 feet. Total depth reached 89 feet.
4. (AS-114) At BM TT-21-C, southeast end of Gully Pond in SE-¼ NE-¼ NE-¼, Sec. 15, T. 1 N., R. 14 W., Washington County, Florida; at an elevation of 61 feet. Total depth reached 64 feet.
5. (AS-115) On a dirt road at Joiner's Lake, in NE-¼ SW-¼ NW-¼, Sec. 5, T. 1 N., R. 14 W., one mile west of Greenhead Cemetery; 200 feet south of Crystal Lake Post Office, Washington County, Florida; at an elevation of 75.93 feet. Total depth reached 93 feet.
6. (AS-116) At site of abandoned saw mill, seven-tenths mile west of

church and three-tenths mile north of red house, in NW-¼ SW-¼ NW-¼, Sec. 14, T. 2 N., R. 15 W., Washington County, Florida; at an elevation of 206.01 feet. Total depth reached 69 feet.

7. (AS-117) Small point between Hicks Pond and Lucas Pond in SE/cor. of NE-¼, Sec. 26, T. 2 N., R. 15 W., Washington County, Florida; at an elevation of 77 feet. Total depth reached 62 feet.
8. (AS-160) Seventy-five feet south, 1,100 feet east of NW/cor., Sec. 32, T. 2 N., R. 14 W., Washington County, Florida; at an elevation of 170 feet. Total depth reached 99.5 feet.
9. (AS-161) Five hundred feet north, fifty feet west of NE/cor., SE-¼, Sec. 30, T. 2 N., R. 14 W., Washington County, Florida; at an elevation of 100 feet. Total depth reached 69.5 feet.
10. (AS-162) N-¼ NW-¼ NE-¼, Sec. 24, T. 2 N., R. 15 W., Washington County, Florida; at an elevation of 165 feet. Total depth reached 84.5 feet.
11. (AS-163) NW-¼ SW-¼, Sec. 32, T. 2 N., R. 14 W., Washington County, Florida; at an elevation of 114 feet. Total depth reached 74.5 feet.
12. (AS-164) SE/cor. of SW-¼ NW-¼, Sec. 5, T. 1 N., R. 14 W., Washington County, Florida, at an elevation of 140 feet. Total depth reached 69.5 feet.
13. (AS-165) SW/cor. of SE-¼ NE-¼ SW-¼ NW-¼, Sec. 5, T. 1 N., R. 14 W., Washington County, Florida; at an elevation of 100 feet. Total depth reached 24.5 feet.
14. (AS-227) SW-¼ SE-¼ SE-¼, Sec. 5, T. 1 N., R. 14 W., Washington County, Florida, at an elevation of 135 feet. Total depth reached 105 feet.
15. (AS-228) NE-¼ SW-¼ NW-¼, Sec. 5, T. 1 N., R. 14 W., Washington County, Florida; at an elevation of 80 feet. Total depth reached 80 feet.
16. (AS-229) NW-¼ SW-¼ SW-¼, Sec. 32, T. 2 N., R. 14 W., Washington County, Florida; at an elevation of 140 feet. Total depth reached 105 feet.
17. (AS-230) NE-¼ SW-¼ NW-¼, Sec. 15, T. 2 N., R. 17 W., Walton County, Florida; at an elevation of 170 feet. Total depth reached 85 feet.
18. (AS-231) Albert H. Cosson's farm (formerly Frazier's farm) SE-¼, Sec. 18, T. 2 N., R. 19 W., Walton County, Florida; at an elevation of 150 feet. Total depth reached 85 feet.
19. (AS-232) Toward upper end of the Shell Bluff on the right bank of Shoal River, 5 miles north of Mossyhead, SW-¼ SW-¼ NW-¼, Sec. 4, T. 4 N., R. 22 W., Walton County, Florida; at an elevation of 150 feet. Total depth reached 100 feet.
20. (AS-233) At old saw mill near Oak Grove, on right bank of Yellow River, 300 feet south of NW/cor. of NE-¼, NE-¼, Sec. 20, T. 5 N., R. 23 W., about 100 yards below bridge on Laurel Hill-Oak Grove Road, Okaloosa County, Florida; at an elevation of 90 feet. Total depth reached 75 feet.

WELL SECTIONS

1. (W-148) Walton Land Lumber Company No. 1, 10 miles south of DeFuniak Springs on Freeport Road, Sec. 12, T. 1 N., R. 19 W., Walton County, Florida; at an elevation of 200.1 feet. Total depth reached 5,375 feet.
2. (W-2157) City of Niceville well, 500 feet east-southeast of Mossy Creek, 50 feet south of State Road No. 10, behind City Hall, NE-¼ NW-¼, Sec. 7, T. 1 S., R. 22 W., one block northwest of post office at Niceville, Okaloosa County, Florida; at an elevation of 14.0 feet. Total depth reached 465 feet.

BIBLIOGRAPHY

Allen, John H.
1846 Some facts respecting the geology of Tampa Bay, Florida: Am. Jour. Sci., 2nd ser., vol. 1, pp. 38-42.

Applin, Esther R. (Also see Applin, Paul)
1925 (and Ellisor, A. C., and Kniker, H. T.) Subsurface Stratigraphy of the Coastal Plain of Texas and Louisiana: Am. Assoc. Petroleum Geologists Bull. 9, pp. 79-122.

Applin, Paul L.
1944 (and Applin, Esther R.) Regional subsurface stratigraphy and structure of Florida and southern Georgia: Am. Assoc. Petroleum Geologists Bull., vol. 28, no. 12, pp. 1673-1753.

Barton, Donald C.
1933 (and Ritz, C. H., and Hickey, Maude) Gulf Coast geosyncline: Am. Assoc. Petroleum Geologists Bull., vol. 17, pp. 1446-1458.

Cahill, Edgar D. (See Cushman, J. A.)

Campbell, Robert B.
1939 Outline of the geologic history of peninsular Florida: Florida Acad. Sci. Proc., vol. 4, pp. 87-105, 11 figs.

Caster, K. E.
1934 The stratigraphy and paleontology of northwestern Pennsylvania: Bull. Am. Paleontology, vol. 21, no. 71, pp. 1-185.

Clapp, F. G. (See Matson, G. C.)

Conrad, T. A.
1846a Observations on the geology of a part of East Florida; with a catalogue of Recent shells of the Coast: Am. Jour. Sci., 2nd ser., vol. 2, pp. 36-48.
1846b Description of new species of organic remains from the upper Eocene limestone of Tampa Bay: Am. Jour. Sci., 2nd ser., vol. 2, pp. 399-400.
1848 Observations on Eocene formations and descriptions of 105 new fossils of that period from the vicinity of Vicksburg, Mississippi: Proc. Philadelphia Acad. Sci., vol. 3, pp. 19-27.

Cooke, C. W. (Also see Vaughan, T. W.)
1929 (and Mossom, Stuart) Geology of Florida: Florida Geol. Survey 20th Ann. Rept., pp. 29-227, 29 pls.
1930a Pleistocene seashores: Washington Acad. Sci. Jour., vol. 20, pp. 389-395.
1930b Correlation of coastal terraces: Jour. Geology, vol. 38, pp. 577-589.
1931 Seven coastal terraces in the southeastern States: Washington Acad. Sci. Jour., vol. 21, pp. 503-513.
1933 Pleistocene changes of sea level (abstract): Geol. Soc. America Bull., vol. 44, pt. 1, pp. 177-178.
1939a Scenery of Florida interpreted by a geologist: Florida Geol. Survey Bull. 17, 118 pp.
1939b Boundary between Oligocene and Miocene: Am. Assoc. Petroleum Geologists Bull., vol. 23, pp. 1560-1561.
1945 Geology of Florida: Florida Geol. Survey Bull. 29, 339 pp.

Cushman, Joseph A.
1918 Some Pliocene and Miocene Foraminifera of the Coastal Plain of the United States: U. S. Geol. Survey Bull., 676, 100 pp., 31 Pls.
1920 Lower Miocene Foraminifera of Florida: U. S. Geol. Survey Prof. Paper 128, pp. 67-74, 1 Pl.
1930 The Foraminifera of the Choctawhatchee formation of Florida: Florida Geol. Survey Bull. 4, pp. 1-89, 12 Pls.
1932 (and Ponton, G. M.) The Foraminifera of the upper, middle, and part of the lower Miocene of Florida: Florida Geol. Survey Bull. 9, 147 pp., 2 figs., 17 Pls.
1933 (and Cahill, Edgar D.) Miocene Foraminifera of the Coastal Plain of the eastern United States: U. S. Geol. Survey Prof. Paper 175, pp. 1-50.

1939 (and Ellisor, A. C.) New species of Foraminifera from the Oligocene and Miocene: Cushman Lab. Foram. Research Contr., vol. 15, pt. 1, pp. 1-14, 4 Pls.

Dall, W. H.

1890-1903 Contributions to the Tertiary fauna of Florida with especial reference to the Miocene silex beds of Tampa and the Pliocene of the Caloosahatchee River: Wagner Free Inst. Sci. Trans., vol. 3, pts. 1-6, pp. 1-1654, 60 Pls. Pt. 1, 1890; pt. 2, 1892; pt. 3, 1895; pt. 4, 1898; pt. 5, 1900; pt. 6, 1903.

1892 (and Harris, G. D.) Correlation Papers—Neocene: U. S. Geol. Survey Bull. 84, 349 pp.

1894 (and Stanley-Brown, J.) Cenozoic geology along the Apalachicola River: Geol. Soc. America Bull., vol. 5, pp. 147-170.

1898 A table of the North American Tertiary horizons, correlated with one another and with those of western Europe, with annotations: U. S. Geol. Survey 18th Ann. Rept., pt. 2, pp. 323-348.

1913 On a brackish-water Pliocene fauna of the southeastern Coastal Plain: U. S. Nat. Mus. Proc., vol. 46, pp. 225-237.

1915 A monograph of the molluscan fauna of the *Orthaulax pugnax* zone of the Oligocene of Tampa: Smithsonian Inst. Bull. 90, 173 pp., 26 Pls.

Darton, N. H.

1891 Mesozoic and Cenozoic formations of eastern Virginia and Maryland: Geol. Soc. America Bull., vol. 2, pp. 431-450, Pl. 16.

Echols, Dorothy A. (see Malkin, Doris S.)

Ellis, Albert D., Jr. (Also see Garrett, J. B.)

1939 Significant Foraminifera from the Chickasawhay beds of Waynes County, Mississippi: Jour. Paleontology, vol. 13, pp. 423-424.

Ellison, Samuel P.

1951 Microfossils as environment indicators in marine shales: Jour. Sedimentary Petrology, vol. 21, pp. 214-225.

Ellisor, A. C. (Also see Applin, Esther; Cushman, J. A.)

1940 Subsurface Miocene of southern Louisiana: Am. Assoc. Petroleum Geologists Bull., vol. 24, pp. 435-475.

1944 Anahuac Formation: Am. Assoc. Petroleum Geologists Bull., vol. 28, pp. 1355-1375, 7 Pls.

Ericson, David B. (See Rainwater, E. H.)

Finch, John

1823 Geological Essay on the Tertiary formation in America: Am. Jour. Sci., vol. 7, pp. 31-43.

Fisk, H. N.

1940 Geology of Avoyelles and Rapides parishes: Louisiana Geol. Survey Bull. 18, 239 pp.

Foerste, August F.

1893 Studies of the Chipola Miocene of Bainbridge, Georgia, and of Alum Bluff, Florida: Am. Jour. Sci., 3rd ser., vol. 46, pp. 244-254.

1894 The upper Vicksburg Eocene and the Chattahoochee Miocene of southeast Georgia and adjacent Florida: Am. Jour. Sci., 3rd ser., vol. 48, pp. 41-54.

Gardner, Julia A.

1924 Coastal Plain and European Miocene and Pliocene mollusks: Geol. Soc. America Bull., vol. 35, pp. 857-866.

1926-1944 The molluscan fauna of the Alum Bluff group: U. S. Geol. Survey Prof. Paper 142, 491 pp., 51 Pls. (Incomplete; pts. A-D, 1926; pt. E, 1928; pt. F, 1937; pt. G, 1944).

1936 Additions to the fauna of the Alum Bluff group of Florida: Florida Geol. Survey Bull. 14, 82 pp., 10 Pls.

Garrett, J. B.

1937 (and Ellis, A. D., Jr.) Distinctive Foraminifera of the genus *Marginulina* from middle Tertiary Beds of the Gulf Coast: Jour. Paleontology, vol. 11, pp. 629-633, Pl. 86.

1938 The Hackberry Assemblage—An Interesting Fauna of Post-

Vicksburg Age from Deep Wells in the Gulf Coast: Jour. Paleontology, vol. 12, pp. 309-317.
1939 Some Middle Tertiary smaller Foraminifera from subsurface beds of Jefferson County, Texas: Jour. Paleontology, vol. 13, pp. 575-79.
Grabau, A. W.
1924 Principles of stratigraphy: 2nd edition, New York.
Gravell, D. W.
1937 (and Hanna, M. A.) The *Lepidocyclina texana* horizon in the *Heterostegina* zone, upper Oligocene, of Texas and Louisiana: Jour. Paleontology, vol. 11, pp. 517-529, Pls. 60-65.
1938 (and Hanna, M. A.) Subsurface Tertiary zones of correlation through Mississippi, Alabama and Florida: Am. Assoc. Petroleum Geologists Bull., vol. 22, pp. 984-1013.
Guidebook
1934 Shreveport Geological Society, Eleventh Ann. Rept.
1945 Southeastern Geological Society, Third Field Trip.
Gunter, Herman (See Sellards, E. H.)
Hamilton, Walter A. (See Phleger, Fred B., Jr.)
Hanna, M. A. (See Gravell, D. W.)
Harris, G. D. (See Dall, W. H.)
Hedberg, Hollis D.
1934 Some Recent and fossil brackish to fresh-water Foraminifera: Jour. Paleontology, vol. 8, no. 4, pp. 469-476, 1 fig.
Heilprin, A.
1884 The Tertiary geology of the eastern and southern United States: Acad. Nat. Sci. Philadelphia, Jour., vol. 9, pp. 115-154, maps, Pls.
1887 Exploration on the west coast of Florida and in the Okeechobee Wilderness: Wagner Free Inst. Sci. Trans., vol. 1, 134 pp.
Herring, D., Jr. (See Rainwater, E. H.)
Hickey, Maude (See Barton, D. C.)
Howe, H. V.
1933 Review of Tertiary stratigraphy of Louisiana: Am. Assoc. Petroleum Geologists Bull., vol. 17, pp. 635-648.
1935 (and graduate students) Ostracode of the *Arca* zone of the Choctawhatchee Miocene of Florida: Florida Geol. Survey Bull. 13, pp. 1-37, 4 Pls.
1936 (and McGuirt, J. H.) Salt Domes of Plaquemines and St. Bernard parishes: Louisiana Geol. Survey Bull. 8, pp. 200-276.
1938a (et al.) Report on the geology of Iberville and Ascension parishes: Louisiana Geol. Survey Bull. 13, p. 209, Pl. 1.
1938b (and McGuirt, J. H.) Salt Domes of Iberville and Ascension parishes: Louisiana Geol. Survey Bull. 13, pp. 87-187.
Israelsky, Merle C.
1949 Oscillation chart: Am. Assoc. Petroleum Geologists Bull., vol. 33, no. 1, pp. 92-98, 3 figs., 1 chart.
Johnson, Lawrence C.
1885 Phosphatic rocks of Florida: Science, vol. 5, p. 396.
1888 The structure of Florida: Am. Jour. Sci., 3rd ser., vol. 36, pp. 230-236.
1892 The Chattahoochee Embayment: Geol. Soc. America Bull., vol. 3, pp. 128-133.
Jung, Dorothy A. (See Malkin, Doris S.)
Kniker, H. T. (See Applin, Esther R.)
Ladd, H. S.
1951 Brackish-water and Marine Assemblages of the Texas Coast, with special reference to Mollusks: Inst. Marine Sci., Univ. Texas, vol. 2, no. 1, pp. 125-164, 2 figs., 2 tables.
Langdon, D. W.
1889 Some Florida Miocene: Am. Jour. Sci., 3rd ser., vol. 38, pp. 322-324.
1891a Geological section along the Chattahoochee River from Columbus to Alum Bluff: Georgia Geol. Survey 1st Prog. Rept., pp. 90-97.

1891b Variations in the Cretaceous and Tertiary strata of Alabama: Geol. Soc. America Bull., vol. 2, pp. 587-606, Pl. 23.

Lowman, S. W.

1949a Discussion of sedimentary facies in geologic history: Geol. Soc. America Mem. 39, pp. 125, 130, 4 figs.; pp. 145-151, 3 figs.

1949b Sedimentary facies in Gulf Coast: Am. Assoc. Petroleum Geologists Bull., vol. 33, no. 12, pp. 1939-1997, 35 figs.

MacNeil, F. Stearns

1944 Oligocene stratigraphy of southeastern United States: Am. Assoc. Petroleum Geologists Bull., vol. 28, pp. 1313-1354.

1950 Pleistocene shore lines in Florida and Georgia: U. S. Geol. Survey Prof. Paper 221-F, pp. 95-107.

Malkin, Doris S.

1941 (and Jung, Dorothy A.) Marine sedimentation and oil accumulation. I Transgressive marine overlap: Am. Assoc. Petroleum Geologists Bull., vol. 25, no. 11, pp. 2010-2020.

1948 (and Echols, Dorothy A.) Marine sedimentation and oil accumulation. II Regressive marine offlap and overlap-offlap: Am. Assoc. Petroleum Geologists Bull., vol. 32, no. 2, pp. 252-261.

Mansfield, Wendell C.

1916 Mollusks from the type locality of the Choctawhatchee marl: U. S. Nat. Mus. Proc., vol. 51, pp. 599-607.

1924 A contribution to the late Tertiary and Quaternary paleontology of northeastern Florida: Florida Geol. Survey 15th Ann. Rept., pp. 25-51, 2 Pls.

1930 Miocene gastropods and scaphopods of the Choctawhatchee formation of Florida: Florida Geol. Survey Bull. 3, 142 pp., 21 Pls.

1932a Miocene pelecypods of the Choctawhatchee formation of Florida: Florida Geol. Survey Bull. 8, 240 pp., 3 figs., 34 Pls.

1932b (and Ponton, G. M.) Faunal zones in the Miocene Choctawhatchee formation of Florida: Washington Acad. Sci. Jour., vol. 22, pp. 84-88.

1935 New Miocene gastropods and scaphopods from Alaqua Creek Valley, Florida: Florida Geol. Survey Bull. 12, 64 pp., 5 Pls.

1936a Stratigraphic significance of Miocene, Pliocene, and Pleistocene Pectinidae in the southeastern United States: Jour. Paleontology, vol. 10, no. 3, pp. 168-192. 2 Pls.

1936b A new species of "Crassatellites" from the upper Miocene of Florida: Washington Acad. Sci. Jour., vol. 26, p. 395.

1937a Mollusks of the Tampa and Suwannee limestones of Florida: Florida Geol. Survey Bull. 15, 334 pp.

1937b New Mollusks from the Choctawhatchee formation of Florida: Jour. Paleontology, vol. 11, pp. 608-612, 1 Pl.

Matson, G. C.

1909 (and Clapp, F. G.) A preliminary report on the geology of Florida with special reference to the stratigraphy: Florida Geol. Survey 2nd Ann. Rept., 1908-1909, pp. 25-173.

1913 (and Sanford, S.) Geology and ground water of Florida: U. S. Geol. Survey Water-Supply Paper 319, 445 pp.

McGuirt, J. H. (See Howe, H. V.)

McLean, James D., Jr.

1950 Later Tertiary foraminiferal zones of the Gulf Coast: Printed privately by James D. McLean, Jr., Alexandria, Virginia.

Mincher, A. R.

1941 The fauna of the Pascagoula formation: Jour. Paleontology, vol. 15, pp. 337-348, 2 Pls.

Mossom, Stuart (Also see Cooke, C. W.)

1925 A preliminary report on the limestones and marls of Florida: Florida Geol. Survey 16th Ann. Rept., pp. 28-203.

1926 A review of the structure and stratigraphy of Florida, with special reference to the petroleum possibilities: Florida Geol. Survey 17th Ann. Rept., pp. 169-275.

Moore, Raymond C.
1949 Meaning of facies: Geol. Soc. America Mem. 39, pp. 1-34, 18 figs.
Norton, Richard D.
1930 Ecologic relationship of some Foraminifera: Scripps Instit. Oceanography, Bull. Tech. ser., vol. 2, no. 9, pp. 331-388.
Parker, Frances L.
1952 Foraminiferal distribution in the Long Island Sound: Harvard Coll. Mus. Comp. Zoology Bull., vol. 106, no. 10, pp. 427-473, 5 Pls.
Phleger, Fred B., Jr.
1939 Foraminifera of submarine cores from the Continental Slope: Geol. Soc. America Bull., vol. 50, pp. 1395-1422, 4 figs., 3 Pls.
1942 Foraminifera of submarine cores from the Continental Slope: Geol. Soc. America Bull., vol. 53, pp. 1073-1098, 6 figs., 3 Pls.
1945 Vertical distribution of Pelagic Foraminifera: Am. Jour. Sci., vol. 243, pp. 377-383.
1946 (and Hamilton, Walter A.) Foraminifera of two submarine cores from the North Atlantic Basin: Geol. Soc. America Bull., vol. 57, pp. 951-966.
1951 Ecology of Foraminifera, Northwest Gulf of Mexico, Pt. 1, Foraminifera Distribution: Geol. Soc. America Mem. 46, 88 pp., 2 Pls., 33 figs., 37 tables.
1952 Foraminifera distribution in some sediment samples from the Canadian and Greenland Artic: Cushman Found. Foram. Research Contr., vol. 3, pt. 2, pp. 80-89, Pls. 13, 14.
Ponton, G. M. (See Cushman, J. A.; Mansfield, Wendall C.)
Pope, D. E.
1949 (and Smith, D. J.) The Harang fauna of Louisiana: Louisiana Geol. Survey Bull. 26, 80 pp., 12 Pls.
Pumpelly, Raphal
1893 An apparent time-break between the Eocene and the Chattahoochee Miocene in southwestern Georgia: Am. Jour. Sci., 3rd ser., vol. 46, pp. 445-447.
Puri, Harbans S.
1952a Ostracode genera *Cytheretta* and *Paracytheretta* in America: Jour. Paleontology, vol. 26, no. 2, pp. 199-212, Pls. 39, 40; 16 text figs.
1952b Ostracode genus *Cytherideis* and its allies: Jour. Paleontology, vol. 26, no. 6, pp. 902-914, Pls. 130, 131, 14 text figs.
1953a The Ostracode genus *Trachyleberis* and its ally *Actinocythereis*: Am. Midland Naturalist, vol. 49, pp. 171-187, 2 Pls.; text figs. A-G.
1953b Ostracode genus *Hemicythere* and its allied genera: Jour. Washington Acad. Sci., vol. 43, pp. 168-179, 2 Pls.
1953c Taxonomic comment on: "Ostracoda from wells in North Carolina, I. Cenozoic Ostracoda" by F. M. Swain: Jour. Paleontology, vol. 27, pp. 750-752.
Rainwater, E. H.
1945 (with Herring, D., Jr., and Ericson, David B.) Third Field Trip, Western Florida: Southeastern Geol. Soc., 93 pp., geologic map.
Ritz, C. H. (See Barton, D. C.)
Sanford, S. (See Matson, G. C.)
Scott, Gayle
1940 Paleoecological factor controlling the distribution and mode of life of Cretaceous Ammonoids in the Texas area: Jour. Paleontology, vol. 14, pp. 299-323, 9 figs.
Sellards, E. H.
1908 Sketch of the geology of Florida: Florida Geol. Survey 1st Ann. Rept., pp. 17-25.
1918 (and Gunter, Herman) Geology between the Choctawhatchee and Apalachicola rivers in Florida: Florida Geol. Survey 10th and 11th Ann. Repts., 1917-1918, pp. 77-102.

1919 Review of the geology of Florida, with special reference to structural conditions: Florida Geol. Survey 12th Ann. Rept., 1918-1919, pp. 105-141.

Smith, D. J. (See Pope, D. E.)

Smith, Eugene

1881 On the geology of Florida: Am. Jour. Sci., 3rd ser., vol. 21, pp. 292-309.

1885 Phosphatic rocks of Florida: Science, vol. 5, pp. 395-396.

Smith, Hendee R.

1941 Micropaleontology and stratigraphy of a deep well at Niceville Okaloosa County, Florida: Am. Assoc. Petroleum Geologists Bull., vol. 25, pp. 263-286, 3 figs., 2 Pls.

South Louisiana Geological Society

1944-1945 Progress Report of the geological names and correlation committee, W. R. Canada, Chairman.

Stanley-Brown, J. (See Dall, W. H.)

Stephenson, M. B.

1935 Some microfossils of the *Potamides matsoni* zone of Louisiana: Louisiana Geol. Survey Bull. 6, pp. 187-196.

1938 Miocene and Pliocene Ostracoda of the genus *Cytheridea* from Florida: Jour. Paleontology, vol. 12, pp. 127-148, Pls. 23, 24.

Tuomey, M.

1851 Notice on the geology of the Florida Keys, and the southern coast of Florida: Am. Jour. Sci., 2nd ser., vol. 11, pp. 390-394.

Twenhofel, W. H.

1931 Environment in sedimentation and stratigraphy: Geol. Soc. America Bull., vol. 42, pp. 407-424.

1942 The rate of deposition of sediments: A major factor connected with alteration of sediments after deposition: Jour. Sedimentary Petrology, vol. 12, no. 3, pp. 99-110, fig. 1.

Van Voorthuysen, J. H.

1951 The quantitative distribution of the Holocene Foraminifera in the N. O. Polder: Third International Congress of Sedimentology, Groningen-Wageningen Proc., pp. 267-272, 1 Pl.

Vaughan, T. W.

1910 A contribution to the geologic history of the Floridian plateau: Carnegie Inst. Washington Pub. 133, pp. 99-185.

1914 (and Cooke, C. W.) Correlation of the Hawthorn formation: Washington Acad. Sci. Jour., vol. 4, no. 10, pp. 250-253.

Veatch, A. C.

1906 Geology and underground water resources of northern Louisiana and southern Arkansas: U. S. Geol. Survey Prof. Paper 46, pp. 42-43.

Vernon, Robert O.

1942 Geology of Holmes and Washington counties, Florida: Florida Geol. Survey Bull. 21, 161 pp., 20 figs.

1951 Geology of Citrus and Levy counties, Florida: Florida Geol. Survey Bull. 33, 256 pp., 2 Pls.

Woodring, W. P.

1925 Miocene mollusks from Bowden, Jamaica: Carnegie Inst., Washington Pub. 385, pt. 2, p. 90.

Part II

CONTRIBUTION TO THE STUDY OF THE MIOCENE OF THE FLORIDA PANHANDLE

FORAMINIFERA

PART II

TABLE OF CONTENTS AND TAXONOMY

The following foraminiferal associations are ascertained in the Miocene of the Florida Panhandle:

ILLUSTRATIONS

Part II

SYSTEMATIC TREATMENT

In the following pages will be found the known species of various genera of Foraminifera that occur in the Miocene of the Florida Panhandle. The species are arranged by their geologic sequence on the plates, but only the dominant and diagnostic species of the various facies are refigured. Cushman (1930) and Cushman and Ponton (1932) did a comprehensive job of describing and illustrating the foraminiferal fauna. In part, their original drawings were rearranged by the geologic sequence of the diagnostic species and are reproduced in the end of this report. A comprehensive synonomy of the species is included in the systematic part and the nomenclature followed here is that which is in current use. Notes on the diagnostic characteristic of species, whenever they seem pertinent, are added. The reader is referred to Cushman (1930) and Cushman and Ponton (1932) for more specific details.

Family SACCAMMINIDAE
Subfamily SACCAMMININAE
Genus PROTEONINA Williamson, 1858
Proteonina difflugiformis (H. B. Brady)
Plate 27, figs. 6, 7.

Proteonina difflugiformis (H. B. Brady) (?), Cushman, 1930, Florida Geol. Survey Bull. 4, p. 15, pl. 1, figs. 1a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 39.

Typical specimens of this species occur at the *Arca* facies locality no. 26 and *Cancellaria* facies locality no. 58.

Genus LEPTODERMELLA Rhumbler, 1935
Leptodermella arenata (Cushman)
Plate 27, figs. 4, 5

Pseudarcella arenata Cushman, 1930, Florida Geol. Survey Bull. 4, p. 15, pl. 1, figs. 3a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 39.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and *Cancellaria* facies locality no. 58.

Family TEXTULARIIDAE
Subfamily TEXTULARIINAE
Genus TEXTULARIA Defrance, 1824
Textularia agglutinans d'Orbigny
Plate 14, figs. 9, 10

Textularia agglutinans d'Orbigny, 1839, in De la Sagra, Historia físca, politica y natural de la isla de Cuba, Foraminifères, p. 136, pl. 1, figs. 17, 18, 32-34.

———— H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 363, pl. 43, fig. 1.

———— Cushman, 1922, U. S. Nat. Mus. Bull. 104, Pt. 3, p. 7, pl. 1, figs. 4, 5.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 16, pl. 1, figs. 4a, b.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 39.

———— Lalicker and Bermudez, 1941, Torreia, Habana, No. 8, p. 6, pl. 1, fig. 7.

———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 57, pl. 2, figs. 7, 8.

Typical specimens of this species occur at the Chipola facies locality no. 10 and the Shoal River facies locality no. 18.

Textularia articulata d'Orbigny

Textularia articulata d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, p. 250, pl. 15, figs. 16-18.

———— Cushman and Ellisor, 1945, Jour. Paleontology, vol. 19, p. 547, pl. 71, fig. 11.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 9; the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 31, 32; and the *Ecphora* facies locality no. 37.

Textularia candeiana d'Orbigny
Plate 30, figs. 9, 10

Textularia candeiana d'Orbigny, 1839, in De la Sagra, Historia físca, politica y natural de la isla de Cuba, Foraminifères, p. 143, pl. 1, figs. 25-27.

———— Cushman, 1922, U. S. Nat. Mus. Bull. 104, Pt. 3, p. 8, pl. 1, figs. 1-3.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 41, pl. 8, figs. 4a, b.

———— Lalicker and McCulloch, 1940, Allan Hancock Pacific Exped., vol. 6, No. 2, p. 121, pl. 13, fig. 7.

———— Lalicker and Bermudez, 1941, Torreia, Habana, No. 8, p. 8, pl. 2, fig. 4.

———— Galloway and Heminway, 1941, New York Acad. Sci., vol. 3, Pt. 4, p. 329, pl. 8, fig. 5.

———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 60, pl. 2, figs. 28-30.

Typical specimens of this species occur at the *Arca* facies locality no. 28 and the *Cancellaria* facies locality no. 49.

Textularia cf. *T. dibollensis* Cushman and Applin

Textularia dibollensis Dumble, 1924, Bull. Am. Assoc. Petroleum Geologists, vol. 8, p. 443 (nomen nudum).

———— Cushman and Applin, 1926, idem., vol. 10, p. 165, pl. 6, figs. 12-14.

———— Ellisor, 1933, idem., vol. 11, pl. 1, fig. 4.

———— Cushman, 1935, U. S. Geol. Survey Prof. Paper 181, p. 8, pl. 1, figs. 13-16.

This species is represented by some broken tests at the *Cancellaria* facies locality no. 58.

Textularia floridana Cushman

Plate 18, figs. 1, 2

Textularia transversaria Flint (not H. B. Brady), 1897 (1899), Rept. U. S. Nat. Mus., p. 283, pl. 28, fig. 4.
Textularia floridana Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 24, pl. 1, fig. 7.
———— Cushman, 1922, U. S. Nat. Mus., Bull. 104, pt. 3, p. 18, pl. 2, figs. 11, 12.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 18, pl. 1, figs. 9a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 41.

This species has its smooth, elongate, (two to three times as long as broad), much compressed test with the sides nearly parallel in the adult. The chambers are numerous, thickest near the center; suture nearly at right angles to the periphery. It occurs commonly at the *Cancellaria* locality nos. 49 and 51 and so far as is known, it is confined to the *Cancellaria* facies.

Textularia folicaea occidentalis Cushman

Plate 18, figs. 3, 4, 5

Textularia concava Flint (part) (not Karrer), 1897 (1899), Rept. U. S. Nat. Mus., p. 283.
Textularia foliacea Heron-Allen and Earland, var. *occidentalis* Cushman, 1922, U. S. Nat. Mus. Bull. 104, pt. 3, p. 16, pl. 2, fig. 13.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 41-42, pl. 1, figs. 4, 5.

This species is characterized by its coarsely arenaceous, rough, broadly rhomboid, very compressed test with comparatively few but large chambers. The sutures are distinct and straight. It occurs commonly at the *Cancellaria* locality no. 58 and has not been observed at any other part of the section.

Textularia gramen d'Orbigny

Plate 30, figs. 7, 8

Textularia gramen d'Orbigny, 1846, Foram. Foss. Vienne, p. 248, pl. 15, figs. 4-6.
———— Cushman, 1918, U. S. Geol. Survey Bull. 676, pp. 8, 45, pl. 9, fig. 5 (not 2 and 3).
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 17, pl. 1, figs. 5a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 39.

This species is characterized by its compressed, slightly longer than broad, subacute test with early chambers strongly overlapping. It occurs commonly at the Chipola locality no. 12; and *Arca* locality no. 24; and *Cancellaria* locality no. 57, but it is more abundant in the *Cancellaria* locality.

Textularia mayori Cushman

Plate 20, figs. 7, 8

Textularia gramen Cushman (in part) (not d'Orbigny), 1918, U. S. Geol. Survey Bull. 676, pl. 9, figs. 2, 3 (not 5).
Textularia mayori Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 23, pl. 2, fig. 3.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 17, pl. 1, figs. 6-8.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 40, pl. 1, figs. 2, 3.

This species is characterized by compressed test, rapidly increasing in breadth, with often indistinct chambers, each with an elongate, hollow spine; those of the earlier chambers directed backward. It occurs commonly at the *Ecphora* localities nos. 38, 40 and *Cancellaria* localities nos. 48, 50, 52, 53, 54, 55, and 58. Cushman (1930, p. 40) also recorded this species from the *Yoldia* and the Shoal River facies but the present study did not reveal its occurrence in beds older in age than the *Ecphora-Cancellaria* facies of the Choctawhatchee Stage.

Textularia warreni Cushman and Ellisor

Plate 10, figs. 1, 2

Textularia warreni Cushman and Ellisor, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 51, pl. 7, figs. 2a, b.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 42, pl. 1, figs. 6a, b.

This species is characterized by its rather smooth, much compressed, broad test with subacute periphery with median line somewhat raised. Sutures are distinct and raised. It occurs commonly at the Shoal River localities nos. 17, 18, 19 and 20 and is an excellent marker for the Shoal River facies.

Textularia sp. Cushman and Ponton

Plate 14, figs. 4, 5

Textularia sp.? Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 42, pl. 1, figs. 7a, b.

This species occurs at the Chipola facies locality no. 3 and the Shoal River facies locality no. 17.

Genus BIGENERINA d'Orbigny, 1826

Bigenerina floridana Cushman and Ponton

Plate 11, figs. 3, 4, 5, 6, 7

Bigenerina floridana Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 42, 43, pl. 1, figs. 9-12.

Typical specimens of this species occur at the Oak Grove facies locality no. 15 and the Shoal River facies localities nos. 17 and 20.

Bigenerina nodosaria textularioidea (Goës)

Plate 22, fig. 13

Textularia sagittula Defrance, forma *bigenerina* Goës, 1882, Köngl. Svensk. Vet. Akad. Handl., vol. 19, Pt. 4, p. 78, pl. 5, figs. 159-160.
Clavulina textularioidea Goës, 1894, idem. vol. 25, p. 42, pl. 8, figs. 387-399.
Bigenerina nodosaria Flint, 1897 (1899), U. S. Nat. Mus. Rept., p. 286, pl. 31, fig. 4.
——— Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 25, pl. 2, figs. 5, 6.
Bigenerina nodosaria d'Orbigny, var. *textularioidea* (Goës), Cushman, 1922, U. S. Nat. Mus. Bull. 103, p. 25, pl. 5, figs. 8, 9.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 42, pl. 1, fig. 8.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 8, pl. 1, fig. 14.
——— Lalicker and Bermudez, 1941, Torreia, Habana, No. 8, p. 4, pl. 1, fig. 2.
——— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 67, pl. 3, figs. 1, 2.

Typical specimens of this species occur at the *Arca* facies locality no. 24; and the *Ecphora* facies locality no. 37.

Bigenerina sp.

Incomplete specimens of this species occur at the Chipola facies localities nos. 8, 9, 10, and 12. They may represent broken tests of *Bigenerina nodosaria textularioidea* (Goës).

TABLE 1

DISTRIBUTION OF TEXTULARIIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Textularia agglutinans	——		——				
Textularia articulata	——				——	——	
Textularia candeiana					——		——
Textularia cf. T. dibollensis							——
Textularia floridana							——
Textularia foliacea occidentalis							——
Textularia gramen	——				——		——
Textularia mayori			——	——		——	——
Textularia warreni			——				
Textularia sp.	——		——				
Bigenerina floridana		——	——				
Bigenerina nodosaria textularioidea					——	——	
Bigenerina sp.	——						

Family VALVULINIDAE
Subfamily VALVULININAE
Genus CLAVULINA d'Orbigny, 1826
Clavulina tricarinata d'Orbigny
Plate 1, figs. 1, 2

Clavulina tricarinata d'Orbigny, 1839, in De la Sagra Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 111, pl. 2, figs. 16-18.
Valvulina triangularis d'Orbigny, forma *Clavulina angularis* Goës, 1882, Köngl. Svensk. Vet.-Akad. Handl., vol. 19, p. 86, pl. 11, figs. 387-389.
Clavulina tricarinata Cushman, 1922, Carnegie Instit. Washington, Publ. 311, pp. 29, 30, pl. 3, fig. 3.
——— Cushman, 1922, U. S. Nat. Mus. Bull. 104, Pt. 3, p. 89, pl. 17, figs. 3, 4.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 43, pl. 1, figs. 13a, b.
——— Bermudez, 1935, Mem. Soc. Cubana Hist. Nat., vol. 9, p. 154, pl. 11, figs. 4-6.
——— Galloway and Heminway, 1941, New York Acad. Sci., vol. 3, Pt. 4, p. 326, pl. 7, fig. 8.
——— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 79, pl. 4, figs. 11, 12.

Typical specimens of this species occur at the Chipola facies localities nos. 3 and 11.

Genus COSKINOLINA Stache, 1875
?Coskinolina sp.

Eroded specimens of this species occur at the *Arca* facies locality no. 26.

Family SILICINIDAE
Genus MILIAMMINA Heron-Allen and Earland, 1930
Miliammina cf. *M. fusca* (H. B. Brady)
Plate 21, figs. 1, 2, 3

Quinqueloculina agglutinans H. B. Brady, 1865, Trans. Nat. Hist. Northum. and Durham, vol. 1, pp. 87, 95.
Quinqueloculina fusca H. B. Brady, 1870, Ann. and Mag. Nat. History, ser. 4, vol. 6, p. 286, pl. 11, figs. 2, 3.
Quinqueloculina cf. *fusca* Cushman, 1930, Florida Geol. Survey Bull. 4, p. 19, pl. 1, figs. 11, 12.
——— Cushman and Ponton, 1932, idem., Bull. 9, p. 43.

This species occurs at the *Ecphora* facies locality no. 47 and the *Cancellaria* facies localities nos. 53 and 54.

Family MILIOLIDAE
Genus QUINQUELOCULINA d'Orbigny, 1826
Quinqueloculina candeiana d'Orbigny
Plate 1, figs. 3, 4, 5

Quinqueloculina candeiana d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 199, pl. 12, figs. 24-26.

———————— Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 65, pl. 13, fig. 1.
———————— Cushman, 1926, idem., Publ. 344, p. 81.
———————— Cushman, 1929, U. S. Nat. Mus. Bull. 104, Pt. 6, p. 27, pl. 3, fig. 1.
———————— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 44, pl. 2, figs. 1a-c.

Typical specimens of this species occur at the Chipola facies locality no. 12.

Quinqueloculina chipolensis Cushman and Ponton
Plate 1, figs. 6, 7, 8, 9, 10

Quinqueloculina chipolensis Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 45-46, pl. 3, figs. 1-3.

This species is characterized by its subcircular test in side view, sharp peripheral angle and keeled and regular fine pitting extending over the entire surface. It occurs commonly at the Chipola facies locality no. 9 and is a good marker for the Chipola facies.

Quinqueloculina contorta d'Orbigny
Plate 17, figs. 1, 2, 3

Quinqueloculina contorta d'Orbigny, 1846, Foram. Foss. Vienne, p. 298, pl. 20, figs. 4-6.
———————— Cushman, 1929, U. S. Nat. Mus. Bull. 104, pt. 6, p. 29, pl. 3, figs. 6a-c.
———————— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 20, pl. 2, figs. 6a-c.
———————— Cushman and Ponton, 1932, idem., Bull. 9, p. 44.

This species is characterized by its somewhat longer than broad test, polygonal chambers in cross section, slightly concave or flattened sides and periphery and a smooth surface. It occurs commonly in the *Ecphora* facies localities nos. 40, 44 and 47 and is an excellent marker for the *Ecphora* facies.

Quinqueloculina costata d'Orbigny
Plate 28, figs. 1, 2, 3

Quinqueloculina costata d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 301, No. 3.
———————— Terquem, 1878, Mem. Soc. Géol. France, sér. 3, vol. 1, p. 63, pl. 6 (11), figs. 3a-c.
Miliolina costata Heron-Allen and Earland, 1915, Trans. Zool. Soc. London, vol. 20, p. 579, pl. 44, figs. 9-12.
Quinqueloculina costata Cushman, 1917, U. S. Nat. Mus. Bull. 71, pt. 6, p. 49, pl. 15, fig. 1.
———————— Cushman, 1922, Carnegie Instit. Washington Publ. 311, p. 66, pl. 11, fig. 5.
———————— Cushman, 1929, U. S. Nat. Mus., Bull. 104, pt. 6, p. 31, pl. 3, figs. 7a-c.
———————— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 44, 45, pl. 2, figs. 2, 3.

This species is characterized by its somewhat longer than broad test, rounded periphery, distinct and inflated chambers which are rounded in cross section. The surface ornamentation consists of very distinct, longitudinal costae which are oblique to the periphery. It occurs commonly at the *Arca* locality no. 28; *Cancellaria* locality no. 57, and Chipola locality no. 12.

Quinqueloculina crassa d'Orbigny

Quinqueloculina crassa d'Orbigny, 1825, Ann. Sci. Nat., p. 135 (nomen nudum).
——— ——— Fornasini, 1905, Accad. Sci. Instit. Bologna, ser. 6, vol. 2, p. 65, pl. 3, fig. 52-b.

Typical specimens of this species are reported from the Chipola facies localities nos. 1, 2, 6 and 10. This species has not been observed in any other part of the section.

Quinqueloculina crassa subcuneata Cushman
Plate 14, figs. 1, 2, 3

Miliolina crassa Heron-Allen and Earland (part) (not d'Orbigny), 1915, Trans. Zool. Soc. London, vol. 20, p. 572, pl. 42, fig. 41 (not 37-40).
Quinqueloculina crassa d'Orbigny, var. *subcuneata* Cushman, 1921, U. S. Nat. Mus. Bull. 100, vol. 4, p. 423, pl. 89, figs. 4a-c.
——— ——— Cushman, 1924, Carnegie Instit. Washington Publ. 342, p. 62, pl. 23, fig. 7.
——— ——— Cushman, 1929, U. S. Nat. Mus. Bull. 104, pt. 6, p. 30, pl. 5, figs. 1a-c.
——— ——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 45, pl. 2, figs. 5a-c.

This species is characterized by its short and broad test, wedge-shaped chambers, sharp periphery and obscure costate surface ornamentation. It occurs commonly at the Chipola facies locality no. 12, and the Oak Grove facies locality no. 16.

Quinqueloculina lamarckiana d'Orbigny

Quinqueloculina lamarckiana d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 189, pl. 11, figs. 14, 15.
Quinqueloculina cuvieriana Cushman, 1919 (not d'Orbigny), Carnegie Instit. Washington Publ. 291, p. 69.
Quinqueloculina lamarckiana Cushman, 1929, U. S. Nat. Mus. Bull. 104, Pt. 6, p. 26, pl. 2, fig. 6.
Quinqueloculina cf. *Q. lamarckiana* Cushman and Stainforth, 1945, Cushman Lab. Foram. Res. Special Publ. 14, p. 20, pl. 2, fig. 14.
Quinqueloculina lamarckiana Bermudez, 1949, idem., Special Publ. 25, p. 101, pl. 6, fig. 5.

Typical specimens of this species occur at the Chipola facies locality no. 4; the *Ecphora* facies locality no. 37; and the *Cancellaria* facies localities nos. 54, and 57.

Quinqueloculina seminula (Linné)

"Conchula minima arcte in se contorta, etc." Plancus 1739, De Conchis min. not., p. 19, pl. 11, figs. 1A, B, C.
"Tubulus marinus inregulariter intortus vermicularis" Gualtieri, 1742, Index Test., pl. 10, fig. S.
Sepula seminulum Linnaeus, 1767, Syst. Nat. ed. 12, p. 1264.

Quinqueloculina seminulum d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 303.
Miliolina seminulum Williamson, 1858, Rec. Foram. Gt. Britain, p. 85, pl. 7, figs. 183-185.
———— Brady, 1884, *Challenger* Rept., p. 157, pl. 5, fig. 6.
Quinqueloculina seminulum Cushman, 1918, U. S. Nat. Mus. Bull. 103, p. 78, pl. 27, figs. 4a, b; pl. 28, figs. 1-3; pl. 29, figs. 1a-e.
———— Cushman, 1918, U. S. Geol. Survey, Bull. 676, pp. 22, 70, pl. 1, fig. 8; pl. 28, figs. 2, 4, 5; pl. 29, fig. 1.
———— Cushman, 1929, U. S. Nat. Mus. Bull. 104, p. 24, pl. 2, figs. 1, 2.
Quinqueloculina seminula Cushman, 1930, Florida Geol. Survey Bull. 4, p. 19, pl. 2, figs. 1, 2.
Quinqueloculina seminulum Galloway and Heminway, 1941, New York Acad. Sci., vol. 3, Pt. 4, p. 305, pl. 2, fig. 8.
———— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 102, pl. 6, fig. 6.

Typical specimens of this species occur at the *Arca* facies locality no. 27 and at the *Cancellaria* facies locality no. 58.

Quinqueloculina subpoeyana Cushman

Plate 13, figs. 7, 8, 9

Quinqueloculina subpoeyana Cushman, 1922, Carnegie Instit. Washington Publ. 311, p. 66.
———— Cushman, 1929, U. S. Nat. Mus., Bull. 104, pt. 6, p. 31, pl. 5, figs. 3a-c.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 21, pl. 2, figs. 7a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 44, pl. 2. figs. 4a-c.

This species is characterized by its elongate (two and a half times as long as wide) test, rounded periphery and distinct chambers. The ornamentation consists of numerous irregularly toothed costae. It is common at the Chipola facies locality no. 12 and the Shoal River facies locality no. 20. It is very rare in the Choctawhatchee Stage.

Genus FLINTINA Cushman, 1921

Flintina floridana Cushman and Ponton

Plate 16, figs. 1, 2, 3

Flintina floridana Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 55, pl. 7, figs. 3-6.

Typical specimens of this species occur at the *Arca* facies localities nos. 25, 26, 28 and 34.

Genus MASSILINA Schlumberger, 1893

Massilina bosciana (d'Orbigny)

Plate 2, figs. 4, 5, 6

Quinqueloculina bosciana d'Orbigny, 1839, in De la Sagra, Historia fisica, politica y natural de la isla de Cuba, Foraminifères, p. 191, pl. 11, figs. 22-24.
Massilina bosciana Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 46, pl. 3, figs. 5a-c.

Typical specimens of this species occur at the Chipola facies locality no. 1.

Massilina gunteri Cushman and Ponton
Plate 18, figs 6, 7, 8

Massilina gunteri Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 47, pl. 4, figs. 1a-c.

Typical specimens of this species occur at the *Cancellaria* facies locality no. 51.

Massilina inaequalis Cushman
Plate 2, figs. 1, 2, 3

Massilina inaequalis Cushman, 1921, Proc. U. S. Nat. Mus., vol. 59, p. 72, pl. 17, figs. 12, 13.

.... Cushman, 1929, idem., Bull. 104, pt. 6, p. 38, pl. 7, figs. 6a-c.

.... Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 46, pl. 3, figs. 4a-c.

Typical representatives of this species occur at the Chipola facies locality no. 12. It has not been found at any other locality throughout the Miocene.

Massilina incisa Cushman and Ponton
Plate 3, figs. 1, 2, 3

Massilina incisa Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 47, pl. 4, figs. 1, 2-6.

Typical specimens of this species occur at the Chipola facies locality no. 12.

Massilina quadrans Cushman and Ponton
Plate 2, figs. 7, 8, 9, 10, 11

Massilina quadrans Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 47, pl. 3, figs. 6-8.

Typical specimens of this species occur at the Chipola facies localities nos. 1 and 2.

Massilina spinata Cushman and Ponton
Plate 3, figs. 4, 5, 6

Massilina spinata Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 48, pl. 5, figs. 1-3.

Typical specimens of this species occur at the Chipola facies locality no. 12.

Massilina spinata chipolensis Cushman and Ponton
Plate 3, figs. 7, 8, 9

Massilina spinata Cushman and Ponton, var. *chipolensis* Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 48, 49, pl. 5, figs. 4-6.

Typical specimens of this species occur at Chipola facies locality no. 12.

Massilina spinata glabrata Cushman and Ponton
Plate 4, figs. 1, 2, 3

Massilina spinata Cushman and Ponton, var. *glabrata* Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 49, pl. 5, figs. 7a, b, c.

This variety differs from the typical species in having a smooth surface and tooth-like projections reduced or even missing. It occurs at the Chipola facies localities nos. 3 and 12.

Massilina sp.

This species is reported from the *Ecphora* facies locality no. 44. Imperfection of the test prevents a specific identification.

Genus SPIROLOCULINA d'Orbigny, 1826

Spiroloculina dentata Cushman and Todd
Plate 20, figs. 3, 4

Spiroloculina planulata Cushman and Valentine, 1930, (not Lamarck), Contr. Dept. Geol. Stanford Univ., vol. 1, p. 15, pl. 4, fig. 3.

——— Cushman and Todd, 1944 (n. name), Cushman Lab. Foram. Res. Special Publ. 11, pp. 71, 72, pl. 9, figs. 33, 34.

Typical specimens of this species occur at the *Arca* facies localities nos. 34, 35 and the *Ecphora* facies localities nos. 42, 47.

Spiroloculina depressa d'Orbigny
Plate 17, figs. 6, 7

Spiroloculina depressa d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 298.

——— d'Orbigny, 1826, Mod. No. 92.

——— Guérin-Menévillé's Cuvier, 1829-43, Iconographie, Mollusques, p. 10, pl. 3, fig. 7.

Spiroloculina badenensis d'Orbigny, 1846, Foram. Foss. Vienne, p. 270, pl. 16, figs. 13-15.

Spiroloculina dilatata d'Orbigny, 1846, ibid, p. 271, pl. 16, figs. 16-18.

Spiroloculina sandbergeri Reuss, 1853, Neues Jahrb. für Min., p. 671, pl. 9, fig. 2.

Spiroloculina depressa Parker, Jones and Brady, 1865, Ann. and Mag. Nat. Hist., ser. 3, vol. 16, p. 33, pl. 1, fig. 6.

——— Parker, Jones and Brady, 1871, idem., ser. 4, vol. 8, p. 248, pl. 8, fig. 23.

——— Terquem, 1875, Essai Class Anim. Dunkerque, Pt. 1, p. 38, pl. 5, fig. 18.

——— Terquem, 1878, Mém. Soc. géol. France, ser. 3, vol. 1, p. 54, pl. 5 (10), fig. 11.

——— Schlumberger, 1893, Mém. Soc. zool. France, vol. 6, p. 202, pl. 3, fig. 69, text fig. 2.

——— Fornasini, 1904, Mem. Accad. Sci. Instit., Bologna, ser. 6, vol. 1, p. 3, pl. 1, fig. 1.

Spiroloculina libyca Martinotti, 1920, Atti. Soc. Ital. Nat., vol. 59, p. 271, pl. 2, figs. 9, 10, text figs. 40-42.

Spiroloculina depressa Cushman, 1929, U. S. Nat. Mus. Bull. 104, p. 44, pl. 9, fig. 9 (not fig. 8).

———— Hofker, 1932, Publ. Stat. Zool. Napoli, vol. 12, Pt. 1, p. 100, text fig. 20.
———— Colom, 1942, Instit. Espanol Oceanografia, Notas y Resúmenes ser. 2, No. 108, p. 27, pl. 6, figs. 114, 115.
———— Cushman and Todd, 1944, Cushman Lab. Foram. Res., Special Publ. 11, pp. 28-30, pl. 1, figs. 1, 6; pl. 5, figs. 1-9.

Typical specimens of this species occur at the *Ecphora* facies locality no. 40.

Spiroloculina profunda Cushman and Todd

Spiroloculina antillarum Cushman, 1918 (not d'Orbigny), U. S. Geol. Survey Bull. 676, p. 21, pl. 8, fig. 2.
Spiroloculina excavata Cushman, 1918 (not d'Orbigny), ibid, p. 21, pl. 6, fig. 6.
Spiroloculina antillarum d'Orbigny, var. *angulata* Cole, 1931 (not Cushman), Florida Geol. Survey Bull. 6, p. 23, pl. 2, fig. 14.
Spiroloculina grateloupi Cushman and Ponton, 1932 (not d'Orbigny), idem, Bull. 9, p. 49.
Spiroloculina profunda Cushman and Todd, (n. name) 1944, Cushman Lab. Foram. Res. Special Publ. 11, pp. 38, 39, pl. 6, fig. 14.

Typical specimens of this series occur at the Chipola facies locality no. 9.

Spiroloculina sp. (?)

Spiroloculina sp. (?) Cushman, 1930, Florida Geol. Survey Bull. 4, p. 22, pl. 3, fig. 3.

This peculiarly ornamented species occurs rarely at the *Cancellaria* facies locality no. 58.

Genus SIGMOILINA Schlumberger, 1887

Sigmoilina tenuis (Czjzek)

Plate 14, figs. 6, 7, 8

Quinqueloculina tenuis Czjzek, 1848, Haidinger's Nat. Abhandl., vol. 2, p. 149, pl. 13, figs. 31-34.
———— Reuss, 1850, Denkschr. k. Akad. Wiss. Wien., vol. 1, p. 385, pl. 1, fig. 8.
———— Reuss, 1850, Zeitschr. deutsche geol. Gesell., vol. 3, p. 87, pl. 7, fig. 60.
Spiroloculina tenuis Reuss, 1867, Sitz. Akad. Wiss. Wien., vol. 55, p. 71, pl. 1, fig. 11.
———— Brady, 1884, *Challenger* Rept., vol. 9, p. 152, pl. 10, figs. 7-11.
Sigmoilina tenuis Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, Pt. 4, p. 81, pl. 12, figs. 12-14.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 22, pl. 2, fig. 8.
———— Cushman and Stainforth, 1945, Cushman Lab. Foram. Res., Special Publ. 14, p. 21, pl. 2, fig. 19.
———— Cushman and Todd, 1945, idem., Special Publ. 15, p. 10, pl. 2, fig. 4.
———— Bermudez, 1949, idem., Special Publ. 25, p. 108, pl. 6, fig. 32.

Typical specimens of this species occur at the Chipola facies locality no. 1 and at the Shoal River locality no. 18.

Genus ARTICULINA d'Orbigny, 1826

Articulina advena (Cushman)

Plate 6, figs. 1, 2

Vertebralina advena Cushman, 1922, U. S. Geol. Survey Prof. Paper 129-E, p. 102, pl. 25, figs. 5, 6.
__________ Cushman, 1923, idem., Prof. Paper 133, p. 51.
__________ Howe, 1928, Jour. Paleontology, vol. 2, p. 175 (list).
__________ Cushman and Hanzawa, 1937, Contr. Cushman Lab. Foram. Res., vol. 13, p. 44.
__________ Cushman and McGlamery, 1942, U. S. Geol. Survey Prof. Paper 197-B, p. 66, pl. 4, fig. 5.
Vertebralina cassis Cushman and Ponton (not d'Orbigny), 1932, Florida Geol. Survey Bull. 9, p. 57, pl. 8, fig. 1.
Articulina advena Cushman, 1944, Cushman Lab. Foram. Res., Special Publ., No. 10, p. 8, pl. 1, figs. 20-21.
Articulina advena Cushman and Ellisor, 1945, Jour. Paleontology, vol. 19, p. 552, pl. 72, fig. 9.
__________ Cushman and Todd, 1946, Contr. Cushman Lab. Foram. Res., vol. 22, p. 81, pl. 14, figs. 8, 9.
__________ Cushman and Todd, 1948, idem., vol. 24, p. 8 (list).
__________ Todd, 1952, U. S. Geol. Survey Prof. Paper 241, p. 9, pl. 1, fig. 27.

Typical specimens of this species occur at the Chipola facies localities nos. 1 and 2.

Articulina mayori Cushman

Plate 4, figs. 9, 10

Articulina mayori Cushman, 1922, Carnegie Instit. Washington Publ. 311, p. 71, pl. 13, fig. 5.
__________ Cushman, 1929, U. S. Nat. Mus., Bull. 104, p. 52, pl. 12, fig. 5.
__________ Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 51, pl. 6, figs. 5a, b.

Typical specimens of this species are reported from the Chipola localities nos. 9 and 12. So far as known at present, this species is restricted to the Chipola facies.

Articulina miocenica Cushman and Ponton

Plate 4, figs. 7, 8

Articulina sagra d'Orbigny, var. *miocenica* Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 51, pl. 6, figs. 2-4.

This is very characteristic of the Chipola facies and is reported from the Chipola localities nos. 9 and 12.

Genus HAUERINA d'Orbigny, 1839

Hauerina miocenica Cushman

Plate 4, figs. 4, 5, 6

Hauerina bradyi Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 50, pl. 6, figs. 1a-c.

Typical specimens of this species occur at the Chipola facies locality no. 1.

Genus TRILOCULINA d'Orbigny, 1826

Triloculina asperula Cushman

Plate 18, fig. 9

Triloculina asperula Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 72, pl. 30, fig. 3.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 23, pl. 1, fig. 13.

This species is characterized by its subcircular test in side view and chambers tapering toward either end. The ornamentation consists of an irregularly roughened surface, and the sutures are distinct. It is reported from *Cancellaria* facies locality no. 48 and has not been found in any other part of the section.

Triloculina brongniartii d'Orbigny

Plate 5, figs. 10, 11, 12

Triloculina brongniartii d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 300, No. 23.

———— Parker, Jones and H. B. Brady, 1871, Ann. and Mag. Nat. History, ser. 4, vol. 8, p. 250, pl. 8, fig. 9.

———— Cushman, 1929, U. S. Nat. Mus. Bull. 104, pt. 6, p. 63, pl. 16, fig. 4.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 54, 55, pl. 6, figs. 11a-c.

This species is characterized by its small, elongate (more than twice as long as broad) test, with rounded periphery, distinct chambers and sutures. The surface is ornamented with coarse, longitudinal costae which are oblique to the periphery. It occurs commonly at the Chipola facies locality no. 12 and so far as is known, it is confined to the Chipola facies.

Triloculina gracilis d'Orbigny

Plate 5, figs. 1, 2, 3

Triloculina gracilis d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 181, pl. 11, figs. 10-12.

———— Cushman, 1929, U. S. Nat. Mus., Bull. 104, pt. 6, p. 59, pl. 14, figs. 4a-c.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 53, pl. 6, figs. 8, 9.

This species is characterized by its slender elongated test with rounded chambers and very slightly depressed sutures. The surface is usually smooth or very finely striated. It occurs commonly at the Chipola facies locality no. 12. This species is confined to the Chipola facies.

Triloculina oblonga (Montagu)

Plate 4, figs. 14, 15, 16

Vermiculum oblongum Montagu, 1803, Test. Brit., p. 522, pl. 14, fig. 9.

Triloculina oblonga d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 300, N. 16, Mod. 95.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 52, pl. 6, figs. 7a-c.

This species is characterized by its smooth, polished, elongate test which is triangular in end view and by its broadly rounded sides. It is very common at the Chipola locality no. 1. This species has not been observed in any other part of the section.

Triloculina quadrilateralis d'Orbigny
Plate 5, figs. 7, 8, 9

Triloculina quadrilateralis d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 173, pl. 9, figs. 14-16.
———— Cushman, 1921, Proc. U. S. Nat. Mus., vol. 59, p. 71, fig. 11.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 53, pl. 7, figs. 1a-c.

This species could be distinguished easily by its somewhat longer than broad test and quadrangular chambers. It occurs abundantly at the Chipola facies locality no. 12 and is restricted to the Chipola facies.

Triloculina quadrilateralis longicostata Cushman and Ponton
Plate 5, figs. 4, 5, 6

Triloculina quadrilateralis d'Orbigny, var. *longicostata* Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 53, 54, pl. 7, figs. 2a-c.

This variety differs from the typical species in having very fine, raised, longitudinal costae, which are very numerous and quite distinct. It has only been found at the Chipola facies locality no. 12 and is apparently restricted to the Chipola facies.

Triloculina rotunda d'Orbigny
Plate 30, figs. 1, 2, 3

Triloculina rotunda d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 299, No. 4.
———— Schlumberger, 1893, Mém. Soc. Zool. France, vol. 6, p. 206, pl. 1, figs. 48-50.
Miliolina rotunda Millett, 1898, Jour. Roy. Micr. Soc., p. 267, pl. 5, figs. 15, 16.
Triloculina rotunda Cushman, 1922, Carnegie Instit. Washington Publ. 311, p. 73.
———— Cushman, 1929, U. S. Nat. Mus. Bull. 104, pt. 6, p. 59, pl. 14, figs. 3a-c.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 54, pl. 6, figs. 10a-c.

Typical specimens of this species occur at the *Arca* facies locality no. 28, *Ecphora* facies locality no. 37, and *Cancellaria* facies localities nos. 54 and 57.

Triloculina schreiberiana d'Orbigny
Plate 30, figs. 4, 5, 6

Triloculina schreiberiana d'Orbigny, 1839, in De la Sagra, Historia fisca,

politica y natural de la isla de Cuba, Foraminifères, p. 174, pl. 9, figs. 20-22.
———— Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 71, pl. 30, fig. 4.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 22, pl. 3, figs. 4a-c.

This species is characterized by its smooth, elongate, oval test with chambers broadest at the basal end, tapering gradually towards the apertural end. The chambers are tumid with depressed sutures. It occurs at the *Arca* facies locality no. 28 and at the *Cancellaria* facies locality no. 58, but rarely.

Triloculina trigonula (Lamarck)
Plate 4, figs. 11, 12, 13

Miliolites trigonula Lamarck, 1804, Ann. Mus., vol. 5, p. 351, no. 3.
Miliolites cor-anguinum Lamarck, ibid, p. 351, no. 2.
Triloculina trigonula d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 299, pl. 16, figs. 5-9, mod. 93.
Triloculina austriaca d'Orbigny, 1846, Foram. Foss. Vienne, p. 275, pl. 16, figs. 25-27.
Triloculina gibba d'Orbigny, ibid, p. 274, pl. 16, figs. 22-24.
Miliolina trigonula Williamson, 1858, Rec. Foram. Gt. Britain, p. 84, pl. 7, figs. 180-182.
Miliola austriaca Egger, 1857, Neues Jahrbuch, p. 271, pl. 6, figs. 4-6.
Triloculina trigonula Parker, Jones and Brady, 1865, Ann. and Mag. Nat. History, ser. 3, vol. 16, p. 33, pl. 1, fig. 7.
———— H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 164, pl. 3, figs. 14-16.
Triloculina trigonula Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 52, pl. 6, figs. 6a-c.
Triloculina gibba Cushman, 1945, Cushman Lab. Foram. Res. Special Publ. 13, p. 26, pl. 3, fig. 10; pl. 6, fig. 11.

Typical specimens of this species occur at the Chipola facies locality no. 12.

Genus Pyrgo Defrance, 1824
Pyrgo denticulata (H. B. Brady)
Plate 5, figs. 13, 14, 15

Biloculina ringens Lamarck, var. *denticulata* H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 143, pl. 3, figs. 4, 5.
———— Heron-Allen and Earland, 1915, Trans. Zool. Soc. London, vol. 20, p. 551, pl. 40, figs. 11-13.
Biloculina denticulata Cushman, 1917, U. S. Nat. Mus. Bull. 71, pt. 6, p. 80, pl. 33, fig. 1.
———— Cushman, 1921, idem., Bull. 100, pt. 4, p. 476, pl. 98, figs. 3a, b.
Pyrgo denticulata Cushman, 1929, idem., Bull. 104, pt. 6, p. 69, pl. 18, figs. 3, 4.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 56, pl. 7, figs. 7, 8.

This species is characterized by its smooth, biconvex, elongate test which is roughly quadrangular in front view; with apertural end broadly rounded but the opposite end with a series of short, irregular teeth. It occurs commonly at the Chipola locality no. 9 and has not been observed in any other part of the section.

TABLE 2

DISTRIBUTION OF MILIOLIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Quinqueloculina candeiana	—						
Quinqueloculina chipolensis	—						
Quinqueloculina contorta						—	
Quinqueloculina costata	—				—		—
Quinqueloculina crassa	—						
Quinqueloculina crassa subcuneata	—	—					
Quinqueloculina lamarckiana	—					—	—
Quinqueloculina seminula					—		—
Quinqueloculina subpoeyana	—		—				
Flintina floridana					—		
Massilina bosciana	—						
Massilina gunteri							—
Massilina inaequalis	—						
Massilina incisa	—						
Massilina quadrans	—						
Massilina spinata	—						
Massilina spinata chipolensis	—						
Massilina spinata glabrata	—						
Massilina sp.						—	
Spiroloculina depressa						—	
Spiroloculina dentata					—	—	
Spiroloculina profunda	—						
Spiroloculina sp. (?)							—
Sigmoilina tenuis	—		—				
Articulina advena	—						
Articulina mayori	—						
Articulina miocenica	—						
Hauerina bradyi	—						
Triloculina asperula							—
Triloculina brongniartii	—						
Triloculina gracilis	—						
Triloculina oblonga	—						
Triloculina quadrilateralis	—						
Triloculina quadrilateralis longicostata	—						
Triloculina rotunda					—	—	—
Triloculina schreiberiana					—		—
Triloculina trigonula	—						
Pyrgo denticulata	—						
Prygo subsphaerica	—		—				

Pyrgo subsphaerica (d'Orbigny)

Plate 13, figs. 10, 11, 12

Biloculina subsphaerica d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 162, pl. 8, figs. 25-27.

.... Cushman, 1921, U. S. Nat. Mus. Proc., vol. 59, p. 73.

Pyrgo subsphaerica Cushman, 1929, idem., Bull. 104, Pt. 6, p. 68, pl. 18, figs. 1, 2.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 23, pl. 3, figs. 5a-c.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 56.

———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 113, pl. 6, fig. 45.

Typical specimens of this species occur at the Chipola facies locality no. 12 and the Shoal River facies locality no. 18.

Family OPHTHALMIDIIDAE

Subfamily CORNUSPIRINAE

Genus CORNUSPIRA Schultze, 1854

Cornuspira involvens (Reuss)

Plate 23, fig. 11

Operculina involvens Reuss, 1850, Denkschr. Akad. Wiss. Wien., vol. 1, p. 370, pl. 46, fig. 30.

Cornuspira involvens Reuss, 1863, Sitz. Akad. Wiss. Wien., vol. 48, Abt. 1, p. 39, pl. 1, fig. 2.

———— Cushman, 1929, U. S. Nat. Mus. Bull. 104, Pt. 6, p. 80.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, pp. 23, 24, pl. 3, fig. 6.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 57.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and at the *Cancellaria* facies locality no. 50.

Subfamily NODOPHTHALMIDIINAE

Genus VERTEBRALINA d'Orbigny, 1826

Vertebralina multilocularis (H. B. Brady, Parker and Jones)

Plate 6, figs. 3, 4, 5

Articulina multilocularis H. B. Brady, Parker and Jones, 1888, Trans. Zool. Soc. London, vol. 12, p. 215, pl. 40, fig. 10.

———— Cushman, 1929, U. S. Nat. Mus. Bull. 104, pt. 6, p. 53, pl. 12, fig. 7.

Vertebralina multilocularis Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 57, 58, pl. 8, figs. 2, 3.

Typical specimens of this species occur at the Chipola facies localities nos. 1 and 2. This species has not been observed in any other part of the section and is a good marker for the Chipola facies.

Family LAGENIDAE

Subfamily NODOSARIINAE

Genus ROBULUS Montfort, 1808

Robulus americanus (Cushman)

Cristellaria americana Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 50, pl. 10, figs. 5, 6.

Robulus americanus Cushman, 1930, Florida Geol. Survey Bull. 4, p. 24, pl. 3, fig. 7.

———— Cushman, 1932, idem., Bull. 9, p. 58.

———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 12, pl. 3, fig. 6.

———— Renz, 1948, Geol. Soc. America Mem. 32, p. 157, pl. 12, fig. 3.

Typical specimens of this species occur at the Chipola facies locality no. 8; the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; and the *Cancellaria* facies localities nos. 48, 50, 53, 54, 57 and 58.

Robulus americanus spinosus (Cushman)

Plate 29, figs. 3, 4

Cristellaria americana Cushman, var. *spinosa* Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 51, pl. 10, fig. 7.
Robulus americanus (Cushman) var. *spinosus* Cushman, 1930, Florida Geol. Survey Bull. 4, p. 24, pl. 3, figs. 7a, b.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 12, pl. 3, fig. 7.
———— Renz, 1948, Geol. Soc. America Mem. 32, p. 157, pl. 12, fig. 4.
———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, pp. 120, 121, pl. 6, figs. 55, 56.

Typical specimens of this species occur at the *Arca* facies localities nos. 25, 28, 30; and *Ecphora* facies locality no. 37.

Robulus catenulatus (Cushman)

Plate 16, figs. 6, 7

Cristellaria catenulata Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 51, pl. 11, fig. 2.
Robulus catenulatus Cushman, 1930, Florida Geol. Survey Bull. 4, pp. 25, 26, pl. 4, figs. 3a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 58.

Typical specimens occur at the *Arca* facies localities nos. 29 and 34. The species is a useful marker for the *Arca* facies of the Choctawhatchee Stage.

Robulus floridanus (Cushman)

Plate 16, figs. 4, 5

Cristellaria floridana Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 51, pl. 11, fig. 1.
Robulus floridanus Cushman, 1930, Florida Geol. Survey Bull. 4, p. 25, pl. 4, figs. 2a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 58.

Typical members of this species occur at the *Arca* facies locality no. 24 and it has not been found in any other part of the section.

Robulus iota (Cushman)

Plate 29, figs. 1, 2

Cristellaria cultrata H. B. Brady (not Montfort), 1884, *Challenger* Rept., Zoology, vol. 9, p. 550, pl. 70, figs. 4-6.
Cristellaria iota Cushman, 1923, U. S. Nat. Mus., Bull. 104, Pt. 4, p. 111, pl. 29, fig. 2; pl. 30, fig. 1.
Robulus iotus Cushman, 1930, Florida Geol. Survey, Bull. 4, p. 25, pl. 4, fig. 1.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 58.
———— Palmer and Bermudez, 1935, Soc. Cubana historia nat. Mem., vol. 9, p. 241.
———— Asano, 1938, Tohoku Imp. Univ. Sci. Repts., ser. 2

(Geol.), vol. 19, No. 2, p. 202 (24), pl. 25 (2), figs. 7, 11; pl. 28 (5), figs. 1, 2.

———— Galloway and Heminway, 1941, New York Acad. Sci., Sci. Survey Porto Rico and Virgin Islands, vol. 3, Pt. 4, p. 349, pl. 12, fig. 7.

———— LeRoy, 1941, Colorado School Mines, Quart., vol. 36, p. 73, pl. 6, figs. 7, 8.

Robulus iota Cushman and Ellisor, 1945, Jour. Paleontology, vol. 19, p. 553, pl. 73, fig. 2.

Typical specimens of this series occur at the *Yoldia* facies localities nos. 21, 22; the *Arca* facies localities nos. 25, 30; the *Ecphora* facies locality no. 40; and the *Cancellaria* locality no. 50.

Robulus vaughani (Cushman)

Cristellaria vaughani Cushman, 1918, U. S. Nat. Mus. Bull. 103, p. 61, pl. 22, fig. 3.

Robulus vaughani Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 59, pl. 8, figs. 5-10.

Typical representatives of this long-range form occur at the following localities: Chipola facies locality no. 6; *Arca* facies localities nos. 24, 26, 30; and *Cancellaria* facies localities nos. 50 and 58.

Genus MARGINULINA d'Orbigny, 1826

Marginulina dubia Neugeboren

Plate 17, figs. 4, 5

Marginulina dubia Neugeboren, 1851, Siebenburg. Ver. Naturwiss. Verh. u. Mitt., vol. 2, p. 120, pl. 4, fig. 1.

———— Cushman and Laiming, 1931, Jour. Paleontology, vol. 5, p. 98, pl. 10, fig. 7.

———— Cushman and Parker, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 3, pl. 1, fig. 6.

Marginulina sp.? Cushman, 1930, Florida Geol. Survey Bull. 4, p. 27, pl. 4, figs. 8a, b.

Marginulina dubia Cushman and Ponton, 1932, idem., Bull. 9, p. 59, pl. 8, figs. 11a, b.

———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 13, pl. 4, figs. 7a, b.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 39, 41 and 47.

Marginulina glabra d'Orbigny

Plate 10, figs. 3, 4

Marginulina glabra d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 259, mod. 55.

———— Parker, Jones and Brady, 1865, Ann. and Mag. Nat. History, ser. 3, vol. 16, p. 27, pl. 1, fig. 36.

———— H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 527, pl. 65, figs. 5, 6.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 59, pl. 8, figs. 12a, b.

Typical specimens of this species occur at the Shoal River facies localities nos. 18 and 19.

Genus DENTALINA d'Orbigny, 1826

Dentalina communis d'Orbigny

Plate 23, fig. 14

Nodosaria (Dentalina) communis d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 254, No. 35.
Dentalina inornata d'Orbigny, 1846, Foram. Foss. Vienne, p. 44, pl. 1, figs. 50, 51.
Dentalina ferstliana Czjzek, 1847, Haid. Nat. Abh., vol. 2, p. 140, pl. 12, figs. 13-19.
Dentalina inornata Reuss, 1863, Sitz. Akad. Wiss. Wien., vol. 48, p. 45, pl. 2, fig. 18.
Dentalina botscheri Reuss, ibid. p. 44, pl. 2, fig. 17.
Nodosaria (Dentalina) communis Parker, Jones and Brady, 1871, Ann. and Mag. Nat. History, ser. 4, vol. 8, p. 158, pl. 9, fig. 46.
Dentalina communis Vanden Broeck, 1876, Ann. Soc. Belge Micr., vol. 2, p. 91, pl. 2, fig. 5.
Nodosaria (Dentalina) communis Fornasini, 1894, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 4, pl. 1, figs. 8-10.
———— Flint, 1897 (1899), Ann. Rept. U. S. Nat. Mus., p. 310, pl. 56, fig. 2.
———— Cushman, 1913, idem. Bull. 71, Pt. 3, p. 54, pl. 28, figs. 1, 2.
———— Cushman, 1923, idem., Bull. 104, Pt. 4, p. 75, pl. 12, figs. 3, 4, 15-17.
Dentalina communis Cushman, 1930, Florida Geol. Survey Bull. 4, p. 27, pl. 5, fig. 1.
———— Cushman, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 68, pl. 8, figs. 22, 23.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 14, pl. 5, fig. 2.
———— Cushman and Todd, 1945, Cushman Lab. Foram. Res. Special Publ. 15, p. 20, pl. 3, fig. 13.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; *Ecphora* facies localities nos 38, 39; and at the *Cancellaria* facies locality no. 57.

Dentalina consobrina emaciata Reuss

Plate 23, fig. 15

Dentalina emaciata Reuss, 1851, Zeitschr. deutsch. geol. Ges., vol. 3, p. 63, pl. 3, fig. 9.
Nodosaria (Dentalina) consobrina, var. *emaciata* Reuss, 1865, Denkschr. Akad. Wiss. Wien., vol. 25, p. 132, pl. 2, figs. 12, 13.
———— H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 502, pl. 62, figs. 25, 26.
———— Flint, 1897 (1899), Rept. U. S. Nat. Mus., p. 310, pl. 56, fig. 1.
———— Cushman, 1913, idem., Bull. 71, Pt. 3, p. 56, pl. 27, fig. 9.
———— Cushman, 1923, idem., Bull. 104, Pt. 4, p. 78, pl. 13, figs. 3-5.
Dentalina consobrina d'Orbigny, var. *emaciata* Cushman, 1930, Florida Geol. Survey Bull. 4, p. 28, pl. 5, fig. 2.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 61.

Typical specimens of this species occur at the *Arca* facies localities nos. 25, 33; and at *Cancellaria* facies locality no. 58.

Dentalina pyrula (d'Orbigny)

Plate 23, figs. 12, 13

Nodosaria pyrula d'Orbigny, 1825, Tableau Méthod.
Nodosaria semirugosa d'Orbigny, 1826, Foram. Foss. Vienne, p. 34, figs. 20-23.
Nodosaria pyrula Williamson, 1858, Rec. Foram. Gt. Britain, p. 17, fig. 39.
Dentalina sp.? Cushman, 1930, Florida Geol. Survey Bull. 4, p. 28, pl. 5, fig. 3.
Dentalina pyrula Cushman and Ponton, 1932, idem., Bull. 9, p. 61, pl. 9, figs. 5, 6.
Dentalina sp.? Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 14, pl. 5, fig. 4.

Typical specimens of this species occur at the *Arca* facies locality no. 24; and at *Ecphora* facies localities nos. 44, 45.

Dentalina sp. A

Plate 6, figs. 6, 7

Dentalina sp.(?) Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 61, pl. 9, figs. 1, 2.

Incomplete tests of this species were found at the Chipola facies locality no. 6. Specific name is not given to this species as most of the specimens are incomplete. Cushman and Ponton (1932, p. 61) also reported it to occur rarely in the type Shoal River, at Shell Bluff, Walton County, Florida.

Dentalina sp. B

Plate 6, figs. 8, 9

Dentalina sp.(?) Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 61, pl. 9, figs. 3, 4.

Fragmentary specimens of this indeterminable form occur at the Chipola facies locality no. 6. It was not observed in any other portion of the section.

Genus Astacolus Montfort, 1808

Astacolus sp. ? (Cushman)

Plate 26, figs. 10, 11

Planularia sp.(?) Cushman, 1930, Florida Geol. Survey Bull. 4, p. 26, pl. 4, figs. 4, 5, 6.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 59.

Typical immature specimens of this species occur at the *Arca* facies locality no. 24, and *Cancellaria* facies locality no. 58.

Genus Nodosaria Lamarck, 1812

Nodosaria calomorpha Reuss

Plate 18, fig. 10

Nodosaria (Nodosaria) calomorpha Reuss, 1866, K. Akad. Wiss. Wien, Math.-Naturw. Cl., Denkschr., Wien, Osterreich, Bd. 25, Abt. 1, p. 129, pl. 1, figs. 15-19.

Nodosaria calomorpha Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 61, 62, pl. 9, fig. 7.

Typical representatives of this species are recorded from the *Cancellaria* facies localities nos. 55 and 58.

Nodosaria catesbyi d'Orbigny
Plate 26, fig. 6

Nodosaria catesbyi d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 16, pl. 11, figs. 8-10.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, pp. 28, 29, pl. 5, fig. 4.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 61.

Typical specimens of this species, which are characterized by a two-chambered test with a short basal spine, are recorded from the *Arca* facies locality no. 24, *Ecphora* facies locality no. 40 and *Cancellaria* facies locality no. 53.

Nodosaria longiscata d'Orbigny

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

———— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 86, pl. 12, figs. 25, 26.

———— Cole and Gillespie, 1930, Bull. Am. Paleontology, vol. 15, No. 57b, p. 8, pl. 3, fig. 9; pl. 4, fig. 1.

———— Cole and Ponton, 1930, Florida Geol. Survey Bull. 5, p. 33, pl. 6, fig. 4.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 62.

———— Cushman and Stainforth, 1945, Cushman Lab. Foram. Res. Special Publ. 14, p. 24, pl. 3, figs. 19-21.

———— Cushman and Todd, 1945, idem., Special Publ. 15, p. 25, pl. 4, figs. 8-10.

———— Bermudez, 1949, idem., Special Publ. 25, p. 145, pl. 9, fig. 57.

This species commonly occurs at the Shoal River locality no. 18.

Genus SARACENARIA Defrance, 1824
Saracenaria acutauricularis (Fichtel and Moll)

Nautilus acutauricularis Fichtel and Moll, 1798, Test. Micr., p. 102, pl. 18, figs. g-i.

Saracenaria acutauricularis Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 88, pl. 13, fig. 12.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 27, pl. 4, fig. 10.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 60.

———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 13, pl. 5, fig. 1.

———— Cushman and Stainforth, 1945, Cushman Lab. Foram. Res. Special Publ. 14, p. 27, pl. 4, fig. 5.

———— Cushman and Ellisor, 1945, Jour. Paleontology, vol. 19, p. 557, pl. 74, fig. 13.

———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 152, pl. 8, figs. 61-62.

Typical specimens of this species occur at the Shoal River facies locality no. 18, the *Arca* facies locality no. 24; the *Ecphora* facies locality no. 40; and the *Cancellaria* facies locality no. 53.

Subfamily LAGENINAE

Genus LAGENA Walker and Jacob, 1798

Lagena clavata (d'Orbigny)

Plate 25, figs. 11, 12

Oolina clavata d'Orbigny, 1846, Foram. Foss. Vienne, p. 24, pl. 1, fig. 2.
Lagena clavata Mackie, 1859, Recreative Sci., vol. 1, p. 148, fig. 13.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 29, pl. 5, figs. 6a, b.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 62.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and at the *Cancellaria* facies locality no. 58.

Lagena costata amphora Reuss

Plate 21, fig. 6

Lagena amphora Reuss, 1862 (1863), Sitz. Akad. Wiss. Wien, vol. 46, Pt. 1, p. 330, pl. 4, fig. 57.
Lagena costata (Williamson); var. *amphora* Cushman, 1913, U. S. Nat. Mus., Bull. 71, Pt. 3, p. 21, pl. 10, figs. 2, 3; pl. 12, fig. 2.
———— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 70, pl. 11, figs. 11, 12.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 31, pl. 5, fig. 8.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 63.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 37, 38, 39; and *Cancellaria* facies locality no. 54.

Lagena perlucida (Montagu)

Vermiculum perlucidum Montagu, 1803, Test. Brit., p. 525, pl. 14, fig. 3.
Lagena perlucida Brown, 1827, Illustrations of the conchology of Great Britain and Ireland, pl. 1, fig. 29.
———— Brown, 1844, idem., 2nd Ed., p. 3, pl. 56, fig. 29.
Lagena vulgaris Williamson, var. *perlucida* Williamson, 1858, Rec. Foram. Gt. Britain, p. 5, pl. 1, figs. 7, 8.
Lagena perlucida Schlumberger, 1882, Feuille des jeunes naturalists, ann. 12, pl. 1, fig. 2.
———— Cushman, 1923, U. S. Nat. Mus. Bull. 104, Pt. 4, p. 46, pl. 8, figs. 12, 13.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 29, pl. 5, fig. 5.
———— Cushman and Parker, 1931, Contr. Cushman Lab. Foram. Res. vol. 7, p. 6, pl. 1, fig. 22.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 62.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 9; *Arca* facies localities nos. 27, 30; *Ecphora* facies localities nos. 37, 40; and *Cancellaria* facies localities nos. 49. 50, 54 and 58.

Lagena substriata Williamson

Plate 26, fig. 1

Lagena substriata Williamson, 1848, Ann. and Mag. Nat. History, ser. 2, vol. 1, p. 15, pl. 1, fig. 12.
Lagena vulgaris substriata Williamson, 1858, Recent Foraminifera, Gt. Britain, p. 7, pl. 1, fig. 14.
Lagena striata substriata Cushman, 1913, U. S. Nat. Mus. Bull. 71, Pt. 3, p. 20, pl. 8, figs. 1-3.
Lagena substriata Cushman, 1923, U. S. Nat. Mus. Bull. 104, Pt. 4, p. 56, pl. 10, fig. 11.
——— Cushman, 1927, Scripps Inst. Oceanography Bull., Tech. ser., vol. 1, p. 145.
——— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 68, pl. 11, fig. 4.
——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 31, pl. 5, fig. 14.
——— Cushman, Stewart and Stewart, 1930, San Diego Soc. Nat. Hist. Trans., vol. 6, No. 2, p. 57, pl. 3, fig. 9.
——— Cushman and Laiming, 1931, Jour. Paleontology, vol. 5, p. 100, pl. 11, fig. 1.
——— Cushman, 1931, Tennessee Div. Geol. Bull. 41, p. 37, pl. 5, fig. 7.
——— Hado, 1931, Tohoku Imp. Uni. Sci. Repts., 4th ser., Biol., vol. 6, p. 108, text fig. 64.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 16, pl. 5, fig. 11.
——— Asano, 1938, Tohoku Imp. Uni. Sci., Repts., 2nd ser. (Geol.), vol. 19, p. 216, pl. 27, fig. 4.
——— Cushman and LeRoy, 1938, Jour. Paleontology, vol. 12, p. 125, pl. 22, fig. 12.
——— Bergquist, 1942, Mississippi Geol. Survey Bull. 49, p. 52, pl. 5, fig. 10.
——— Cushman and Deaderick, 1944, Jour. Paleontology, vol. 18, p. 366, pl. 52, fig. 15.
——— Cushman, 1944, Cushman Lab. Foram. Res., Special Publ. 12, p. 21, pl. 3, fig. 8.
——— Cushman and Todd, 1945, idem., Special Publ. 15, p. 33, pl. 5, fig. 15.
Lagena striata substriata Cushman and Ellisor, 1945, Jour. Paleontology, vol. 15, p. 558.
Lagena striata Cushman, 1946, U. S. Geol. Survey Prof. Paper 206, p. 95, pl. 39, fig. 22.

Typical specimens of this species occur at the *Arca* facies locality no. 24; *Ecphora* facies localities nos. 37, 38, 39; and the *Cancellaria* facies localities nos. 52, 55.

Lagena sulcata (Walker and Jacob)

Plate 26, fig. 8

Serpula (Lagena) sulcata Walker and Jacob, 1798, Adam's Essays, p. 634, pl. 14, fig. 5.
Lagena sulcata H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 462, pl. 57, figs. 23, 26, 33, 34.
——— Cushman, 1923, U. S. Nat. Mus. Bull. 104, Pt. 4, p. 57, pl. 11, fig. 1.
——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 31, pl. 5, fig. 10.
——— Cushman and Ponton, 1932, idem., Bull. 9, p. 63.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 16, pl. 5, fig. 10.
——— Cushman and Ellisor, 1945, Jour. Paleontology, vol. 19,

TABLE 3

DISTRIBUTION OF LAGENIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Robulus americanus	—				—		—
Robulus americanus spinosus					—	—	
Robulus catenulatus					—		
Robulus floridanus					—		
Robulus iota				—	—	—	—
Robulus vaughani	—				—		—
Marginulina dubia						—	
Marginulina glabra			—				
Dentalina communis					—	—	—
Dentalina consobrina emaciata					—		—
Dentalina pyrula					—	—	
Dentalina sp. A	—		—				
Dentalina sp. B	—						
Astacolus sp.					—		—
Nodosaria calomorpha							—
Nodosaria catesbyi					—	—	—
Nodosaria longiscata			—				
Saracenaria acutauricularis			—		—	—	—
Lagena clavata					—		—
Lagena costata amphora						—	—
Lagena perlucida	—				—	—	—
Lagena substriata					—	—	—
Lagena sulcata					—		—
Procerolagena gracilis					—		—

p. 558.

——— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 118, pl. 10, fig. 48.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and the *Cancellaria* facies locality no. 58.

Genus PROCEROLAGENA Puri, n. gen.

Type species: *Lagena gracilis* Williamson

Test elongate, fusiform, highly drawn out on both sides; with a long neck and expanded lip, without an entosolenian tube; aperture terminal. Surface of the test ornamented with strong longitudinal striations, ribs or ridges.

Range: Miocene to Recent.

Procerolagena gracilis Williamson

Plate 25, figs. 9, 10

Lagena gracilis Williamson, 1848, Ann. and Mag. Nat. History, ser. 2, vol. 1, p. 13, pl. 1, fig. 5.

———— Cushman, 1923, U. S. Nat. Mus., Bull. 104, Pt. 4, p. 22, pl. 4, figs. 3, 4.
———— Chapman and Parr, 1926, Jour. Linnean Soc. Zool., vol. 36, p. 374, pl. 17, fig. 4.
———— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 67, pl. 11, fig. 2; p. 88, pl. 13, fig. 11.
———— Hada, 1931, Sci. Rept. Tohoku Imp. Univ., ser. 4, Biol., vol. 6, p. 106, fig. 61.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 64, pl. 9, figs. 8, 9.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and the *Cancellaria* facies locality no. 58.

Family POLYMORPHINIDAE
Subfamily POLYMORPHININAE
Genus POLYMORPHINA d'Orbigny, 1826
Polymorphina advena Cushman
Plate 13, fig. 5

Polymorphina advena Cushman, 1922, U. S. Geol. Survey Prof. Paper 129-F, p. 132, pl. 31, fig. 4.
———— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 41, pl. 7, fig. 5.
———— Cushman and Ozawa, 1930, U. S. Nat. Mus. Proc., vol. 77, Art. 6, p. 118, pl. 30, fig. 10.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 67, pl. 10, fig. 4.
———— Cushman, 1935, U. S. Geol. Survey Prof. Paper 181, p. 29; pl. 10, fig. 8.
———— Cushman and McGlamery, 1938, idem., Prof. Paper 189-D, p. 106, pl. 24, fig. 21.
———— Cushman and Ellisor, 1945, Jour. Paleontology, vol. 19, p. 559, pl. 74, fig. 20.

Typical specimens of this species occur at the Chipola facies locality no. 3 and at the Oak Grove facies locality no. 16.

Genus PSEUDOPOLYMORPHINA Cushman and Ozawa, 1928
Pseudopolymorphina dumblei (Cushman and Applin)
Plate 28, fig. 8

Polymorphina compressa d'Orbigny, var. *dumblei* Cushman and Applin, 1926, Bull. Amer. Assoc. Petroleum Geologists, vol. 10, p. 173, pl. 9, figs. 4, 5.
Pseudopolymorphina dumblei Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, pl. 25, figs. 1a, b.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 35, pl. 6, fig. 5.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 67.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and *Cancellaria* facies locality no. 49.

Pseudopolymorphina rutila (Cushman)
Plate 21, fig. 8

Polymorphina regina H. B. Brady, Parker, and Jones, var. *rutila* Cushman, 1923, U. S. Geol. Survey Prof. Paper 133, p. 34, pl. 5, figs. 7, 8.

Pseudopolymorphina rutila Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, pl. 26, figs. 3a, b.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 36, pl. 5, fig. 20.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 67.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 37, 38, 39, 40 and *Cancellaria* facies localities nos. 48, 53, 54 and 58. This species is confined to the *Ecphora* and *Cancellaria* facies of the Choctawhatchee Stage and is a useful marker for these two facies.

Genus GUTTULINA d'Orbigny, 1826

Guttulina austriaca d'Orbigny

Guttulina austriaca d'Orbigny, 1846, Foram. Foss. Vienne, p. 223, pl. 12, figs. 23-25.
Polymorphina oblonga d'Orbigny, ibid., p. 232, pl. 12, figs. 29-31.
———— H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 569, pl. 73, fig. 4.
Guttulina austriaca Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, p. 29, pl. 4, figs. 3-5.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, pp. 17, 18, pl. 6, figs. 3, 4.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 4, 6, 8, 9; the *Ecphora* facies localities nos. 38, 40; and the *Cancellaria* facies locality no. 57.

Guttulina caudata d'Orbigny
Plate 9, figs. 5, 6

Guttulina caudata d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 266, No. 16.
———— Fornasini, 1900, Boll. Soc. Geol. Ital., vol. 19, p. 137, fig. 2.
———— Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, p. 36, pl. 6, figs. 4, 5.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 65, pl. 9, figs. 16, 17.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 9.

Guttulina costatula Galloway and Wissler
Plate 21, fig. 7

Polymorphina (Guttulina) costatula Galloway and Wissler, 1927, Jour. Paleontology, vol. 1, p. 57, pl. 9, figs. 10a, b.
Guttulina costatula Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, pl. 6, figs. 3a, b.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 33, pl. 5, fig. 15.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 65.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 49, 53, and 54.

Guttulina irregularis (d'Orbigny)

Plate 9, figs. 8, 9, 10

Globulina irregularis d'Orbigny, 1846, Foram. Foss. Vienne, p. 226, pl. 13, figs. 9, 10.

Guttulina irregularis Cushman and Thomas, 1929, Jour. Paleontology, vol. 3, p. 177, pl. 23, figs. 2a-c.

———— Cushman and Ozawa, (part) (not d'Orbigny) 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, p. 25, pl. 3, figs. 4, 5; pl. 7, figs. 1, 2.

———— Howe and Wallace, 1932, Louisiana Geol. Survey Bull. 2, p. 48, pl. 8, fig. 8.

———— Cushman, 1935, U. S. Geol. Survey Prof. Paper 181, p. 24, pl. 9, figs. 13-16.

———— Howe, 1939, Louisiana Geol. Survey Bull. 14, p. 52, pl. 6, fig. 20.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 4, 5, 6, 7, 8, 9 and 13.

Guttulina lactea (Walker and Jacob)

Plate 9, figs. 11, 12

Serpula lactea Walker and Jacob, 1798, Adam's Essay, 2nd ed., p. 634, pl. 24, fig. 4.

Polymorphina lactea (Walker and Jacob), var. *amygdaloides* Brady, Parker and Jones, 1870, Trans. Linnaean Soc. London, vol. 27, p. 214, wood cuts.

Polymorphina lactea H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 559, pl. 71, fig. 11.

———— Bagg, 1904, Maryland Geol. Survey Miocene Rept., p. 477, pl. 133, figs. 5, 6.

———— Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 53, pl. 11, fig. 6.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 65, pl. 9, figs. 15a, b.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 5, 6, 9.

Guttulina lactea earlandi Cushman and Ozawa

Polymorphina concava Jones (not Williamson), 1896, Foram. Crag. Pt. 3, p. 264, pl. 5, fig. 22.

Polymorphina lactea var. *concava* Sidebottom, 1907, Mem. Proc. Manchester Lit. Philos. Soc., vol. 51, No. 9, p. 14, pl. 3, figs. 8, 9.

Guttulina lactea (Walker and Jacob) var. *earlandi* Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Pt. 6, p. 45, pl. 10, fig. 5.

Guttulina lactea (Montagu), var. *earlandi* Cushman, 1930, Florida Geol. Survey Bull. 4, p. 34, pl. 5, fig. 19.

Guttulina lactea (Walker and Jacob) var. *earlandi* Cushman and Ponton, 1932, idem., Bull. 9, p. 65.

Typical specimens of this species occur at the Shoal River facies localities nos. 17, 18, 20; and the *Cancellaria* facies localities nos. 51, 55.

Guttulina roemeri (Reuss)

Globulina roemeri Reuss, 1855 (1856), Sitz. Akad. Wiss. Wien, vol. 18, p. 245, pl. 6, fig. 63.

Guttulina deformata Reuss, ibid., p. 245, pl. 6, fig. 64.

Polymorphina uvula Egger, 1857, Neues Jahrb. für Min., Jahrg., p. 285, pl. 10, figs. 26-29.

Polymorphina deflexa Grzybowski, 1894, Mikrofauna Karpackiego piaskowka Z. Pod. Dukli Krakowie, p. 16, pl. 3, figs. 1, 2.
Guttulina dubia Awerinzew, 1911, Mem. Akad. Imp. Sci. St. Petersbourg, vol. 29, No. 3, p. 19, pl., figs. 4a-d.
Polymorphina sororia Chapman, 1917, Geol. Survey, Western Australia, Bull. 72, p. 34, pl. 10, fig. 92.
Guttulina roemeri Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, p. 41, pl. 9, figs. 3a-c.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 66.

Typical specimens of this species occur at the *Arca* facies locality no. 24.

Genus GLOBULINA d'Orbigny, 1826

Globulina gibba d'Orbigny

Globulina gibba d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 266, No. 10, Modèles, No. 63.
———— d'Orbigny, 1846, Foram. Foss. Vienne, p. 227, pl. 13, figs. 13, 14.
———— Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, p. 60, pl. 16, figs. 1-4.
———— Howe and Wallace, 1932, Louisiana Geol. Survey Bull. 2, p. 46, pl. 8, figs. 11a, b.
———— Cushman, 1935, U. S. Geol. Survey Prof. Paper 181, p. 25, pl. 9, fig. 18.
———— Howe and Wallace, 1939, Louisiana Geol. Survey Bull. 14, p. 53, pl. 6, figs. 25, 26.
———— Cushman and Applin, 1943, Contr. Cushman Lab. Foram. Res., vol. 19, p. 35, pl. 7, fig. 19.
———— Todd, 1952, U. S. Geol. Survey Prof. Paper 241, p. 17, pl. 3, fig. 4.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 14; the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 31, 32; the *Ecphora* facies localities nos. 37, 38, 39; and the *Cancellaria* facies locality no. 49.

Globulina inaequalis Reuss

Globulina inaequalis Reuss, 1850, Denkschr. K. Akad. Wiss. Wien, vol. 1, p. 377, pl. 48, fig. 9.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 35, pl. 5, fig. 22.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 66, pl. 10, figs. 1a-c.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 4, 8; the *Arca* facies localities nos. 24, 30, 32; *Ecphora* facies locality no. 39; and the *Cancellaria* facies localities nos. 50 and 58.

Globulina inaequalis caribaea d'Orbigny

Globulina caribaea d'Orbigny, 1839, in De la Sagra, Historia fìsca, politica y natural de la isla de Cuba, Foraminifères, p. 135, pl. 2, figs. 7, 8.
Globulina inaequalis Reuss, var. *caribaea* Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, p. 75, pl. 18, figs. 5, 6.

—————— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 66, pl. 10, fig. 2.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 5, 8, 13 and at the *Ecphora* facies localities nos. 37 and 38.

Globulina rotundata (Bornemann)
Plate 9, fig. 7

Guttulina rotundata Bornemann, 1855, Zeitschr. deutsch. geol. Gesell., vol. 7, p. 346, pl. 18, fig. 3.
Globulina rotundata Cushman, 1930, Florida Geol. Survey Bull. 4, p. 35, pl. 5, fig. 16.
—————— Cushman and Ponton, 1932, idem., Bull. 9, p. 67.

Typical specimens of this species occur at the Chipola facies localities nos. 4 and 8.

Genus PYRULINA d'Orbigny, 1826
Pyrulina albatrossi Cushman and Ozawa
Plate 18, figs. 13, 14

Pyrulina albatrossi Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, pl. 15, figs. 1-3.
—————— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 34, pl. 5, figs. 17, 18.
—————— Cushman and Ponton, 1932, idem., Bull. 9, p. 66.

Typical specimens of this species occur at the *Cancellaria* facies localities nos. 52 and 56. So far as it is known, this is confined to the *Cancellaria* facies of the Choctawhatchee Stage.

Genus SIGMOMORPHINA Cushman and Ozawa, 1928
Sigmomorphina pearceyi Cushman and Ozawa

Polymorphina inflata Pearcey, 1914, Trans. Roy. Soc. Edinburgh, vol. 49, p. 1023, pl. 2, figs. 14-16.
Sigmomorphina pearceyi Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, p. 132, pl. 35, figs. 2, 3.
—————— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 67, pl. 10, figs. 5a, b.

Typical specimens of this species occur at the Chipola facies locality no. 4 and the Oak Grove facies locality no. 16.

Sigmomorphina undulosa (Terquem)
Plate 6, figs. 10, 11, 12

Polymorphina amygdaloides Terquem (not Reuss), 1878, Mém. Soc. Géol. France, sér. 3, vol. 1, p. 39, pl. 3 (8), figs. 22, 25 (not 23, 24, 26-30).
Polymorphina undulosa Terquem, 1878, ibid., p. 41, pl. 3 (8), figs. 35a, b (not 36).
Sigmomorphina undulosa Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, p. 131, pl. 34, figs. 4, 5.
—————— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 68, pl. 10, figs. 6a-c.

Typical representatives of this species occur at the Chipola facies localities nos. 1 and 2.

Sigmomorphina williamsoni (Terquem)

Plate 28, fig. 7

Polymorphina lactea Walker and Jacob, var. *oblonga Williamson*, 1858, Rec. Foram. Gt. Britain, p. 71, pl. 6, figs. 149, 149a.

Polymorphina williamsoni Terquem, 1878, Mém. Soc. Géol. France, ser. 3, vol. 1, p. 37.

Sigmomorphina williamsoni Cushman and Ozawa, 1930, Proc. U. S. Nat. Mus., vol. 77, Art. 6, pl. 38, figs. 3, 4.

———————— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 36, pl. 6, fig. 4.

———————— Cushman and Ponton, 1932, idem., Bull. 9, p. 67.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and the *Ecphora* facies locality no. 37.

TABLE 4

DISTRIBUTION OF POLYMORPHINIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Polymorphina advena	—	—					
Pseudopolymorphina dumblei					—		—
Pseudopolymorphina rutila						—	—
Guttulina austriaca	—					—	—
Guttulina caudata	—						
Guttulina costatula						—	—
Guttulina irregularis	—						
Guttulina lactea	—						
Guttulina lactea earlandi			—				—
Guttulina roemeri					—		
Globulina gibba	—				—	—	—
Globulina inaequalis	—				—	—	—
Globulina inaequalis caribaea	—					—	
Globulina rotundata	—						
Pyrulina albatrossi							—
Sigmomorphina pearceyi	—	—					
Sigmomorphina undulosa	—						
Sigmomorphina williamsoni					—	—	

Family PENEROPLIDAE

Subfamily SPIROLININAE

Genus PENEROPLIS Montfort, 1808

Peneroplis bradyi Cushman

Plate 7, figs. 1, 2, 3

Peneroplis pertusus (Forskal), var. *planatus* Woodward, 1893, The Observer, vol. 4, p. 77.

Peneroplis planatus Cushman (not Fichtel and Moll), 1921, U. S. Nat. Mus. Proc., p. 75, pl. 18, fig. 9.

———————— Cushman, 1922, Carnegie Instit. Washington Publ. 311, p. 79.

Peneroplis bradyi Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 40, pl. 14, figs. 8-10.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 72, pl. 10, figs. 12, 13.

Typical specimens of this species occur at the Chipola facies locality no. 12.

Genus PUTEOLINA Hofker, 1952

NAUTILUS (part) of authors

PENEROPLIS (part) of authors

Puteolus Hofker, 1949 (not Puteolus Monterosato, 1888)

Puteolina Hofker, 1952 (n. name for Puteolus Hofker)

Puteolina proteus (d'Orbigny)

Plate 6, figs. 15, 16, 17

Peneroplis protea d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 60, pl. 7, figs. 7-11.
Peneroplis dubius d'Orbigny, ibid., p. 62, pl. 6, figs. 21, 22.
Orbiculina adunca H. B. Brady (part), 1884 *Challenger* Rept., vol. 9, pl. 14, figs. 3, 4.
Peneroplis proteus Cushman, 1921, Proc. U. S. Nat. Mus., vol. 59, p. 75, pl. 18, figs. 13-19.
———— Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 79.
———— Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 37, pl. 13, figs. 1-17.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 71, pl. 10, figs. 7-11, 14.
Puteolus proteus Hofker, 1949, Jour. Roy. Micr. Soc. London, ser. 3, vol. 70, Pt. 4, No. 352, p. 394.
Puteolina proteus Hofker in Thalman, 1952, Jour. Paleontology, vol. 26, p. 265.

Typical specimens of this species occur at the Chipola facies locality no. 10.

Genus ARCHAIAS Montfort, 1808

Archaias sp.

This species is very common at the Chipola localities nos. 7, 10 and 14 and has not been observed in any other part of the section. Imperfection of most specimens prevents its specific identity.

Genus SORITES Ehrenberg, 1840

Sorites (?) sp. (?)

Plate 7, fig. 4

Sorites (?) sp. (?) Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 72, 73, pl. 17, figs. 1-8.

This species is recorded from the Chipola facies localities nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14. It is the most characteristic species of the Chipola facies of the Alum Bluff Stage.

TABLE 5

DISTRIBUTION OF PENEROPLIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Peneroplis bradyi	———						
Puteolina proteus	———						
Archaias sp.	———						
Sorites (?) sp. (?)	———						

Family HETEROHELICIDAE
Subfamily GUMBELININAE
Genus GUMBELINA Egger, 1899
?Gümbelina sp.

Specimens questionably referred to the genus *Gümbelina* occur at the *Arca* facies localities nos. 25, 26, 27, 30, 32 and *Ecphora* facies locality no. 37.

Subfamily PLECTOFRONDICULARIINAE
Genus PLECTOFRONDICULARIA Liebus, 1903
Plectofrondicularia floridana Cushman
Plate 13, figs. 3, 4

Plectofrondicularia floridana Cushman, 1930, Florida Geol. Survey Bull. 4, p. 41, pl. 8, fig. 1.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 74, pl. 11, fig. 8.

———— Cushman and Cahill, 1932, U. S. Geol. Survey Prof. Paper 175-A, p. 22, pl. 7, fig. 11.

———— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 175, pl. 11, fig. 42.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 27, 30, 32, 34 and 35.

Plectofrondicularia mansfieldi Cushman and Ponton

Plectofrondicularia mansfieldi Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 74, Pl. 11, figs. 7a, b.

Typical specimens of this species occur at the Oak Grove facies locality no. 16 and at the Shoal River facies localities nos. 18 and 19.

Genus AMPHIMORPHINA Neugeboren, 1850
Amphimorphina sp.
Plate 15, figs. 1, 2, 3

Amphimorphina sp. ? Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 75, pl. 11, figs. 4-6.

Typical specimens of this species occur at the *Yoldia* facies localities nos. 21 and 22.

Genus NODOGENERINA Cushman, 1927

Nodogenerina advena Cushman and Laiming

Plate 15, fig. 4

Nodogenerina advena Cushman and Laiming, 1931, Jour. Paleontology, vol. 5, p. 106, pl. 11, figs. 19a, b.

__________ Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 75, pl. 11, fig. 10.

Typical specimens of this species occur at the *Yoldia* facies localities nos. 21 and 22 and the species is a good marker for the *Yoldia* facies.

Family BULIMINIDAE

Subfamily TURRILININAE

Genus BULIMINELLA Cushman, 1911

Buliminella curta Cushman

Plate 23, fig. 1

Buliminella curta Cushman, 1930, Florida Geol. Survey Bull. 4, p. 43, pl. 8, fig. 4.

__________ Cushman and Ponton, 1932, idem., Bull. 9, p. 75.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 32; and the *Ecphora* facies locality no. 43.

Buliminella elegantissima d'Orbigny

Bulimina elegantissima d'Orbigny, 1839, Voyage Amerique Méridionale, vol. 5, Pt. 5, Foraminifères, p. 51, pl. 7, figs. 13, 14.

__________ Schlumberger, 1882, Feuille Jeun. Nat., vol. 12, p. 8, pl. 1, fig. 14.

__________ H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 402, pl. 50, figs. 20-22.

__________ Sidebottom, 1905, Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, No. 5, p. 11, pl. 2, fig. 6.

Buliminella elegantissima Cushman, 1911, U. S. Nat. Mus. Bull. 71, Pt. 2, p. 89.

__________ Cushman, 1919, idem., Proc., vol. 56, p. 606.

__________ Cushman, 1925, Contr. Cushman Lab. Foram. Res., vol. 1, p. 40, pl. 6, figs. 5a, b.

__________ Cushman and Kellett, 1929, Proc. U. S. Nat. Mus., vol. 75, Art. 25, p. 6, pl. 3, figs. 1-3.

__________ Cushman, 1930, Florida Geol. Survey Bull. 4, p. 42, pl. 8, figs. 2, 3.

__________ Cushman and Ponton, 1932, idem., Bull. 9, p. 75.

__________ Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 185, pl. 12, fig. 13.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 4, 5, 8, 9; *Arca* facies localities nos. 24, 25, 26, 28, 30, 32; *Ecphora* facies localities nos. 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 48, 49, 50, 53, 54, 55, 57, and 58.

Buliminella sp.

Specimens referred to this species occur at the Chipola facies localities nos. 1, 3, 9 and 10. They may represent a small variety of *B. elegantissima* d'Orbigny.

Subfamily BULIMININAE

Genus BULIMINA d'Orbigny, 1826

Bulimina elongata d'Orbigny

Plate 10, figs. 5, 6

Bulimina elongata d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, p. 187, pl. 11, figs. 19, 20.
Bulimina inconstans Egger, 1857, Neues Jahrb. für Min., p. 283, pl. 12, figs. 1-3, 8, 9.
Bulimina scabriuscula Reuss, 1860 (1861), Sitz. Akad. Wiss. Wien, vol. 42, p. 360, pl. 2, figs. 13a, b.
Bulimina gracilis Cushman, 1930, Florida Geol. Survey Bull. 4, p. 43, pl. 8, figs. 5a, b.
Bulimina elongata d'Orbigny, Cushman and Parker, 1937, Contr. Cushman Lab. Foram. Res., vol. 13, p. 49, pl. 7, figs. 1-3.
———— d'Orbigny, Cushman and Parker, 1938, Contr. Cushman Lab. Foram. Res., vol. 14, p. 93, pl. 16, fig. 12.

Typical specimens of this species occur at the Shoal River facies localities nos. 18, and 20.

Bulimina inflata Seguenza

Plate 22, figs. 1, 2

Bulimina inflata Seguenza, 1862, Atti Accad. Gioenia Sci. Nat., ser. 2, vol. 18, p. 109, pl. 1, fig. 10.
———— Hadley, 1934, Bull. Am. Paleontology, vol. 20, No. 70A, p. 16, pl. 2, fig. 9.
———— Cushman and Parker, 1938, Contr. Cushman Lab. Foram. Res., vol. 14, p. 58, pl. 10, figs. 4, 5.
———— Bermudez, 1949, idem., Special Publ. 25, p. 182, pl. 12, fig. 6.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and at the *Ecphora* facies localities nos. 37, 38, and 39.

Bulimina marginata d'Orbigny

Plate 23, fig. 2

Bulimina marginata d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 269, pl. 12, figs. 10-12.
Bulimina pupoides d'Orbigny, var. *marginata* Williamson, 1858, Rec. Foram. Gt. Britain, p. 62, pl. 5, figs. 126, 127.
Bulimina presli Reuss, var. *marginata* Parker and Jones, 1865, Philos. Trans., vol. 155, p. 372, pl. 15, fig. 10; pl. 17, fig. 70.
Bulimina marginata Cushman, 1922, U. S. Nat. Mus. Bull. 104, Pt. 3, p. 91, pl. 21, figs. 4, 5.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 77, pl. 11, fig. 12.
———— Cushman and Todd, 1945, Cushman Lab. Foram. Res., Special Publ. 15, p. 39, pl. 6, fig. 8.

———— Bermudez, 1949, idem., Special Publ. 25, p. 182, pl. 12, fig. 11.

Typical specimens of this species occur at the *Arca* facies localities nos. 25, 26, 27, 28, 30, 32; and at the *Cancellaria* facies localities nos. 49 and 53.

Bulimina ovata d'Orbigny
Plate 16, fig. 11

Bulimina ovata d'Orbigny, 1846, Foram. Foss. Vienne, p. 185, pl. 11, figs. 13, 14.

———— H. B. Brady, 1884, *Challenger* Rept., Zoology, vol. 9, p. 400, pl. 50, figs. 13a, b.

———— Cushman, 1911, U. S. Nat. Mus. Bull. 71, Pt. 2, p. 77, figs. 125a-c.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 78, pl. 11, fig. 11.

———— Cushman and Parker, 1937, Contr. Cushman Lab. Foram. Res., vol. 13, p. 47, pl. 6, figs. 4, 5.

———— Bermudez, 1949, idem., Special Publ. 25, p. 183, pl. 11, fig. 66.

Typical specimens of this species occur at the *Arca* facies localities nos. 28, 32, 35.

Genus FISSURINA Reuss, 1850

Fissurina cf. *F. marginato-perforata* Seguenza

Lagena cf. *marginato-perforata* Cushman, 1930, Florida Geol. Survey Bull. 4, p. 32, pl. 5, fig. 12.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 63.

Cushman and Ponton (1932, p. 63) reported this species from the Oak Grove facies and the Shoal River facies. It also occurs at the Chipola facies locality no. 1; *Arca* facies localities nos. 24, 25, 27, 30; *Ecphora* facies locality no. 39; and *Cancellaria* facies locality no. 58.

Fissurina orbignyana lacunata (Burrows and Holland)
Plate 26, figs. 2, 3

Lagena castrensis H. B. Brady (not Schwager), 1884, *Challenger* Rept., vol. 9, p. 485, pl. 60, figs. 1, 2.

———— Balkwill and Wright, 1885, Trans. Roy. Irish Acad., vol. 28 (Sci.), p. 341, pl. 12, figs. 20, 21.

———— Egger, 1893, K.-bayer. Akad. Wiss. München, Cl. 2, Abh., vol. 18, p. 333, pl. 10, figs. 71, 72.

Lagena lacunata Burrows and Holland, in Jones, 1895, Foram. Crag, p. 205, pl. 7, fig. 12.

Lagena castrensis Flint, 1899, Rept. U. S. Nat. Mus., p. 308, pl. 54, fig. 5.

Lagena orbignyana var. *castrensis* Millet, 1901, Jour. Roy. Micr. Soc., p. 626, pl. 14, fig. 20.

Lagena orbignyana var. *lacunata* Sidebottom, 1910, Mem. Manchester Lit. Philos. Soc., vol. 54, No. 16, p. 19, pl. 2, fig. 14.

———— Sidebottom, 1912, Jour. Quekett Micr. Club, vol. 11, p. 416, pl. 19, figs. 16-18.

———— Cushman, 1913, U. S. Nat. Mus. Bull. 71, Pt. 3, p. 43, pl. 20, fig. 1.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 32, pl. 5, figs. 13a, b.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 63.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 38, 39; and the *Cancellaria* facies localities nos. 48, 50, 54, 55, 57 and 58.

Fissurina cf. *F. striato-punctata* (Parker and Jones)

Plate 26, fig. 7

Lagena sulcata Walker and Jacob var. *striato-punctata* Parker and Jones, 1865, Philosophical Trans., vol. 155, p. 350, pl. 13, figs. 25-27.

Lagena striatopunctata Parker and Jones, H. B. Brady, 1878, Ann. and Mag. Nat. History, 5th ser., vol. 1, p. 434, pl. 20, fig. 3.

———— Balkwill and Wright, 1885, Royal Irish Acad. Trans., vol. 28, Sci., p. 339, pl. 14, fig. 20.

———— Chapman, 1893, Royal Micr. Soc. Jour., p. 584, pl. 8, fig. 15.

———— Goës, 1894, K. svenska vetensk. akad. Handl., vol. 25, no. 9, p. 83, pl. 13, fig. 753.

———— Sidebottom, 1912, Quekett Micr. Club. Jour., vol. 11, p. 392, pl. 16, figs. 7-10.

———— Cushman, 1913, U. S. Nat. Mus. Bull. 71, Pt. 3, p. 30, pl. 14, fig. 10.

———— Cushman, 1923, idem., Bull. 104, Pt. 4, p. 55, pl. 10, fig. 10.

———— Cushman and Todd, 1945, Cushman Lab. Foram. Res. Special Publ. 15, p. 33, pl. 5, fig. 13.

———— Todd, 1952, U. S. Geol. Survey Prof. Paper 241, p. 16, pl. 2, fig. 25.

Typical specimens of this species occur at the *Ecphora* facies locality no. 40 and at the *Cancellaria* facies locality no. 58.

Genus OOLINA d'Orbigny, 1839

Oolina hexagona (Williamson)

Plate 25, figs. 7, 8

Entosolenia squamosa var. *hexagona* Williamson, 1848, Ann. and Mag. Nat. History, 2nd ser., vol. 1, p. 20, pl. 2, fig. 23.

———— Williamson, 1858, Recent Foraminifera of Great Britain, p. 13, pl. 1, fig. 32.

Lagena hexagona Siddall, 1879, Catalogue of Recent British Foraminifera, p. 6.

———— Jones, 1895, Foraminifera of the Crag, Pt. 2, p. 193, pl. 6, fig. 7.

———— Silvestri, 1896, Pont. accad. Nuovi Lincei Mem., vol. 12, p. 117, pl. 2, fig. 19; pl. 3, figs. 1, 2.

———— Reade, 1900, Geol. Mag., vol. 7, pl. 5, fig. 15.

———— Cushman, 1913, U. S. Nat. Mus. Bull., vol. 71, p. 17, pl. 6, figs. 2, 3.

———— Cushman, 1922, U. S. Geol. Survey Prof. Paper 129-F, p. 129, pl. 29, fig. 12.

———— Cushman, 1923, idem., Prof. Paper 133, p. 26.

———— Cushman, 1923, U. S. Nat. Mus. Bull. 104, Pt. 4, p. 24, pl. 4, fig. 6.

———— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 72, pl. 11, fig. 18.

———— Cushman, Stewart and Stewart, 1930, San Diego Soc. Nat. History Trans., vol. 6, p. 57, pl. 3, fig. 7.

———————— Cushman, 1931, Tennessee Div. Geol. Bull. 41, p. 38, pl. 5, fig. 12.
———————— Howe and Wallace, 1932, Louisiana Geol. Survey Bull. 2, p. 28, pl. 6, fig. 14.
———————— Cushman, 1933, Cushman Lab. Foram. Res. Special Publ. 5, pl. 21, fig. 20.
———————— Cushman, 1935, U. S. Geol. Survey Prof. Paper 181, p. 23, pl. 9, fig. 10.
———————— Howe, 1939, Louisiana Geol. Survey Bull. 14, p. 50, pl. 6, fig. 16.
———————— Cushman, 1940, Foraminifera, 3rd Ed., Key, pl. 21, fig. 20.
———————— Bergquist, 1942, Mississippi Geol. Survey Bull. 49, p. 50, pl. 5, fig. 24.
———————— Frizzell, 1943, Jour. Paleontology, vol. 17, p. 348, pl. 56, fig. 26.
———————— Beck, 1943, idem., vol. 17, p. 602, pl. 107, fig. 23.
———————— Cushman, 1945, Contr. Cushman Lab. Foram. Res., vol. 21, p. 3, pl. 1, fig. 7.
———————— Cushman and Todd, 1946, idem., vol. 22, p. 86.
———————— Cushman, 1946, U. S. Geol. Survey Prof. Paper 206, p. 95, pl. 39, fig. 16.
———————— Todd, 1952, idem., Prof. Paper 241, p. 16, pl. 2, fig. 20.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 30; the *Ecphora* facies localities nos. 38, 39; and the *Cancellaria* facies localities nos. 48, 53, 55, 57.

Oolina hexagona scalariformis (Williamson)
Plate 21, figs. 4, 5

Entosolenia squamosa (Montagu), var. *scalariformis* Williamson, 1858, Rec. Foram. Gt. Britain, p. 13, pl. 1, fig. 30.
Lagena scalariformis Reuss, 1862 (1863), Sitz. Akad. Wiss. Wien., vol. 46, Pt. 1, p. 333, pl. 5, figs. 69-71.
Lagena hexagona (Williamson), var. *scalariformis* Cushman, 1913, U. S. Nat. Mus. Bull. 71, Pt. 3, p. 17, pl. 6, fig. 4.
———————— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, Pt. 3, p. 72, pl. 11, fig. 17.
———————— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 30, pl. 5, fig. 7a, b.
———————— Cushman and Ponton, 1932, idem., Bull. 9, p. 62.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 38, 39; and the *Cancellaria* facies localities nos. 48, 50, 55, 57 and 58.

Oolina quadrata (Williamson)
Plate 18, figs. 11, 12

Entosolenia marginata var. *quadrata* Williamson, 1858, Recent Foram. Gt. Britain, pp. 11, 12, pl., figs. 27, 28.
Lagena quadrata Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 64, pl. 12, figs. 17, 18.

This species occurs in the *Cancellaria* facies localities nos. 48, 51.

Cushman and Ponton (1932, p. 64) noted the distinct internal tube of this species and said that "it evidently should be included in *Entosolenia*." The author has followed Parr (1947, pp. 119,

125) in recognizing the genus *Oolina* d'Orbigny with *Entosolenia* Williamson as its junior synonym.

Subfamily VIRGULININAE

Genus VIRGULINA d'Orbigny, 1826

Virgulina fusiformis Cushman

Plate 21, figs. 9, 10

Virgulina fusiformis Cushman, 1930, Florida Geol. Survey Bull. 4, p. 45, pl. 8, figs. 8a, b.

———— Cushman, 1932, Contr. Cushman Lab. Foram. Res., vol. 8, p. 20, pl. 3, figs. 11a, b.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 79.

———— Cushman, 1936, Geol. Soc. America Bull., vol. 47, p. 429, pl. 5, figs. 6, 7.

———— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, pp. 18, 19, pl. 2, fig. 29.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 37, 38; and at the *Cancellaria* facies localities nos. 49, 54 and 58.

Virgulina pontoni Cushman

Virgulina squamosa Cushman, 1918 (not d'Orbigny), U. S. Nat. Mus. Bull. 103, p. 58, pl. 21, fig. 6.

Virgulina floridana Cushman and Laiming, 1931 (not Cushman, 1920), Jour. Paleontology, vol. 5, p. 109, pl. 12, figs. 3a, b.

Virgulina pontoni Cushman, 1932, Contr. Cushman Lab. Foram. Res., vol. 8, p. 17, pl. 3, fig. 7.

———— Cushman and Ponton, Florida Geol. Survey Bull. 9, p. 80, pl. 12, figs. 10, 11.

———— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 19, pl. 2, fig. 26-28.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 4, 5, 6, 8, 9; and the *Arca* facies localities nos. 24, 27, 28, 30, and 32.

Virgulina punctata d'Orbigny

Plate 29, figs. 6, 7

Virgulina punctata d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 139, pl. 1, figs. 35, 36.

Virgulina subsquamosa Flint, 1897 (1899) (not Egger), Rept. U. S. Nat. Mus., p. 291, pl. 37, fig. 7.

Virgulina punctata Cushman, 1921, Proc. U. S. Nat. Mus., vol. 59, p. 52, pl. 11, fig. 15.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 44, pl. 8, figs. 7a, b.

———— Cushman, 1922, Rept. Carnegie Inst. Washington Publ. 311, p. 31, pl. 3, fig. 9.

———— Cole, 1931, idem., Bull. 6, p. 40, pl. 6, fig. 14.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 79.

———— Cushman, 1932, Contr. Cushman Lab. Foram. Res., vol. 8, p. 9, pl. 2, figs. 1a, b.

———— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 23, pl. 3, figs. 25-27.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 48, 49, 50, 52, 53, 54, 55, 57 and 58.

Virgulina sp.

Broken tests of this unidentifiable species occur at the Chipola facies locality no. 10.

Subgenus VIRGULINELLA Cushman, 1932

Virgulina (Virgulinella) gunteri Cushman

Virgulina floridana Cushman, 1929 (not Cushman, 1920), Contr. Cushman Lab. Foram. Res., vol. 5, p. 54, pl. 9, figs. 7-10.
Virgulina gunteri Cushman, 1930, Florida Geol. Survey Bull. 4, p. 44, pl. 9, figs. 1, 2.
——— Cushman and Ponton, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, pl. 4, fig. 17.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 80, pl. 12, fig. 7.
Virgulina (Virgulinella) gunteri Cushman, 1932, Contr. Cushman Lab. Foram. Res., vol. 8, p. 22, pl. 3, figs. 17a, b.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 24, pl. 8, fig. 2.
——— Cushman, 1933, Cushman Lab. Foram. Res. Special Publ. 5, pl. 27, fig. 23.
——— Cushman, 1937, idem., Special Publ. 9, pp. 34, 35, pl. 5, figs. 10-13.

Typical specimens of this species occur at the *Arca* facies localities and the *Cancellaria* facies locality no. 58.

Virgulina (Virgulinella) gunteri curtata Cushman and Ponton

Plate 17, figs. 10, 11

Virgulina gunteri Cushman, var. *curtata* Cushman and Ponton, 1932, Contr. Cushman Lab. Foram. Res., vol. 8, p. 4, pl. 1, fig. 2.
——— Cushman, 1932, idem., vol. 8, p. 22, pl. 3, fig. 18.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 80, pl. 12, fig. 8.
Virgulina (Virgulinella) gunteri var. *curtata* Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 35, pl. 5, fig. 14.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 44, 46 and 47.

Virgulina (Virgulinella) miocenica Cushman and Ponton

Virgulina miocenica Cushman and Ponton, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 32, pl. 4, figs. 14-16.
Virgulina (Virgulinella) miocenica Cushman, 1932, idem. vol. 8, p. 23, pl. 3, fig. 19.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 81, pl. 12, fig. 9.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 24, pl. 8, figs. 3-6.
——— Cushman, 1933, Cushman Lab. Foram. Res. Special Publ. 5, pl. 27, fig. 24.

———— Cushman, 1937, idem., Special Publ. 9, p. 35, pl. 5, figs. 15-16.

Typical specimens of this species occur at the *Chipola* facies localities nos. 3, 8, 9; the *Arca* facies locality no. 31; and the *Ecphora* facies localities nos. 42, 44, 46 and 47.

Genus BOLIVINA d'Orbigny, 1839

Bolivina advena Cushman

Bolivina advena Cushman, 1925, Contr. Cushman Lab. Foram. Res., vol. 1, Pt. 2, p. 29, pl. 5, figs. 1a, b.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 83, pl. 12, fig. 3.

———— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 95, pl. 10, fig. 16.

Typical specimens of this species occur at the *Arca* facies localities nos. 27, 30, 35.

Bolivina floridana Cushman

Plate 22, figs. 9, 10

Bolivina floridana Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 49, pl. 10, fig. 4.

Bolivina descussata Cushman, 1925 (not Brady), Contr. Cushman Lab. Foram. Res., vol. 1, Pt. 2, p. 31, pl. 5, figs. 6a, b.

Bolivina floridana Cushman, 1930, Florida Geol. Survey Bull. 4, p. 46, pl. 8, figs. 15a, b.

———— Cushman and Parker, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 9, pl. 2, fig. 2.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 82.

———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 26, pl. 11, figs. 11a, b.

———— Barrat and von Estorff, 1933, p. 165 (list).

———— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 85, pl. 10, figs. 2, 3.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 32; and at the *Ecphora* facies locality no. 43.

Bolivina marginata Cushman

Bolivina marginata Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 48, pl. 10, fig. 1.

———— Cushman, 1925, Contr. Cushman Lab. Foram. Res., vol. 1, Pt. 2, p. 30, pl. 5, figs. 5a, b.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 45, pl. 8, figs. 9a, b.

———— Cushman and Laiming, 1931, Jour. Paleontology, vol. 5, p. 110, pl. 12, figs. 6-8.

———— Cushman and Parker, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 9, pl. 2, fig. 1.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 81.

———— Barrat and von Estorff, 1933, Jour. Paleontology, vol. 7, p. 171, pl. 23, figs. 14a, b.

——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 25, pl. 8, figs. 9a, b.
——— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 86, pl. 10, figs. 4-6.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 8; and the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, and 32.

Bolivina marginata multicostata Cushman

Plate 22, figs. 3, 4, 5, 6

Bolivina aenariensis (Costa) var. *multicostata* Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 48, pl. 10, fig. 2.
Bolivina marginata Cushman var. *multicostata* Cushman, 1930, Florida Geol. Survey Bull. 4, p. 46, pl. 8, figs. 13, 14.
——— Cushman and Ponton, 1932, idem, Bull. 9, p. 82.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 25, pl. 8, figs. 10a, b.
——— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 87, pl. 10, figs. 7-10.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 28, 32; and the *Cancellaria* facies localities nos. 53, 54.

Bolivina robusta H. B. Brady

Plate 10, fig. 7

Bolivina robusta H. B. Brady, 1881, Quart. Jour. Micr. Sci., vol. 21, p. 27 (nomen nudum).
——— H. B. Brady, 1884, *Challenger* Rept., Zoology, vol. 9, p. 421, pl. 53, figs. 7-9.
——— Egger, 1893, Abhandl. kön. bay. Akad. Wiss. München, Cl. 2, vol. 18, p. 294, pl. 8, figs. 31, 32.
Bolivina acaulis Egger, 1893, ibid., p. 295, pl. 8, figs. 28-30.
Bolivina robusta Cushman, 1911, U. S. Nat. Mus. Bull. 71, p. 36, text figs. 59, 60.
——— Hada, 1931, Tohoku Imp. Univ. Sci. Rept., ser. 4, Biol., vol. 5, p. 131, text fig. 88.
——— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, pp. 131, 132, pl. 17, figs. 1-4.

Typical specimens of this species occur at the Shoal River facies localities nos. 18, 19.

Bolivina paula Cushman and Cahill

Bolivina paula Cushman and Cahill, in Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 84, pl. 12, figs. 6a, b.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 26, pl. 8, figs. 14a, b.
——— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 91, pl. 11, fig. 9.

Typical specimens of this species occur at the Chipola facies locality no. 5; *Arca* facies localities nos. 25, 26, 30; *Ecphora* facies localities nos. 37, 38, 39; and the *Cancellaria* facies localities nos. 48, 49, 53, 55, 57, and 58.

Bolivina plicatella Cushman

Bolivina plicata H. B. Brady, Parker and Jones, 1888 (not d'Orbigny), Trans. Zool. Soc. London, vol. 12, p. 221.
——— Cushman, 1904, Am. Geol., vol. 33, p. 264.
Bolivina plicatella Cushman, 1930, Florida Geol. Survey Bull. 4, p. 46, pl. 8, figs. 10a, b.
——— Cushman and Parker, 1931, U. S. Nat. Mus. Proc., vol. 80, Art. 3, p. 15, pl. 3, fig. 19.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 82.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 26, pl. 8, figs. 12a, b.
——— Cushman, 1937, Cushman Lab. Foram. Res., Special Publ. 9, p. 89, pl. 11, figs. 3, 4.

Typical specimens of this series occur at the Chipola facies localities nos. 5, 8, 9, 10; Oak Grove facies locality no. 16; Shoal River facies locality no. 18; *Arca* facies localities nos. 24, 25; *Ecphora* facies localities nos. 37, 38, 39; and the *Cancellaria* facies localities nos. 48, 52, 53, 54, 55, and 57.

Bolivina plicatella mera Cushman and Ponton

Plate 22, figs. 11, 12

Bolivina plicatella Cushman, var. *mera* Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 82, pl. 12, figs. 4a, b.
——— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 90, pl. 11, figs. 5-8.

Typical specimens of this species occur at the Chipola facies locality no. 12 and the Oak Grove facies locality no. 16.

Bolivina pulchella primitiva Cushman

Plate 21, figs. 11, 12

Bolivina pulchella (d'Orbigny), var. *primitiva* Cushman, 1930, Florida Geol. Survey Bull. 4, p. 47, pl. 8, figs. 12a, b.
——— Cole, 1931, idem, Bull. 6, p. 41, pl. 2, fig. 10.
——— Cushman and Ponton, 1932, idem, p. 83.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 26, pl. 8, figs. 13a, b.
——— Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 90, pl. 12, fig. 6.

Typical specimens of this species occur at the *Ecphora* facies locality no. 37 and at the *Cancellaria* facies localities nos. 48, 53, 54, 55, 57 and 58.

Bolivina sp. A

A few imperfect tests of this species are recorded from the *Arca* facies locality no. 26. Imperfectness of the specimens prevents a specific identification.

Bolivina sp. B

This small immature form is recorded from the Chipola facies localities nos. 1, 4, 6, 8 and 12.

Genus LOXOSTOMA Ehrenberg, 1854

Loxostoma gunteri Cushman

Plate 16, figs. 9, 10

Bolivina karreriana Cushman, 1918 (not H. B. Brady), U. S. Geol. Survey Bull. 676, p. 8, pl. 2, fig. 5.

Loxostomum gunteri Cushman, 1930, Florida Geol. Survey Bull. 4, p. 47, pl. 8, figs. 11a, b.

——— Cole, 1931, idem., Bull. 6, p. 42, pl. 2, figs. 2-4.

——— Cushman and Ponton, 1932, idem., Bull. 9, p. 84.

——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 26, pl. 8, figs. 15a, b.

——— Palmer and Bermudez, 1935, Mem. Soc. Cubana Hist. Nat., vol. 9, p. 248, pl. 20, figs. 3, 16.

Loxostoma gunteri Cushman, 1937, Cushman Lab. Foram. Res. Special Publ. 9, p. 182, pl. 21, fig. 9.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 28, 30, 32.

Subfamily REUSSELLIINAE

Genus REUSSELLA Galloway, 1933

Reussella spinulosa (Reuss)

Verneuilina spinulosa Reuss, 1850, Denkschr. Akad. Wiss. Wien, vol. 1, p. 374, pl. 47, fig. 12.

Reussia spinulosa Schwager, 1877, Boll. com. Geol. Ital., vol. 8, p. 26, pl., fig. 66.

——— Cushman and Kellett, 1929, Proc. U. S. Nat. Mus., vol. 75, Art. 25, p. 9, pl. 3, figs. 10a, b.

——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 48, pl. 8, figs. 17a, b.

——— Cushman and Ponton, 1932, idem., Bull. 9, p. 84, pl. 12, figs. 14-16.

This long-range form is recorded from the following localities: Chipola facies localities nos. 3, 5; Oak Grove facies locality no. 16; *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; *Ecphora* facies localities nos. 37, 38, 39; and *Cancellaria* facies localities nos. 48, 49, 50, 53, 54, 55, 57 and 58.

Reussella cf. *R. rectimargo* (Cushman)

Verneuilina rectimargo Cushman, 1922, U. S. Geol. Survey Prof. Paper 129-F, p. 127, pl. 29, figs. 4, 5.

A species of *Reussella*, very much like *R. rectimargo*, occurs rarely at the Chipola facies locality no. 3.

Reussella sp.

This species is reported from the *Cancellaria* facies localities nos. 48, 50, 53 and 58. It is probably a new form not yet described.

Genus PAVONINA d'Orbigny, 1826

Pavonina miocenica Cushman and Ponton

Plate 19, figs. 3, 4

Pavonina miocenica Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 73, pl. 12, fig. 19.

——— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 199, pl. 12, fig. 62.

Typical specimens of this species occur at the *Cancellaria* facies localities nos. 48 and 56.

Genus CHRYSALIDINELLA Schubert, 1907

Chrysalidinella pulchella (Cushman)

Plate 23, figs. 7, 8

Chrysalidina pulchella Cushman, 1918, U. S. Nat. Mus. Bull. 103, p. 54, pl. 20, figs. 2a-c.
Chrysalidinella pulchella Cushman, 1930, Florida Geol. Survey Bull. 4, p. 48, pl. 8, figs. 16a, b.
——— Cushman and Ponton, 1932, idem., Bull. 9, p. 85.

Typical specimens of this species occur at the *Arca* facies localities nos. 27, 30; *Ecphora* facies locality no. 37; and the *Cancellaria* facies localities nos. 48, 50, 54, 55, 57, and 58.

Subfamily UVIGERININAE

Genus UVIGERINA d'Orbigny, 1826

Uvigerina auberiana d'Orbigny

Plate 27, fig. 8

Uvigerina auberiana d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 106, pl. 2, figs. 23, 24.
——— Cushman, 1923, U. S. Nat. Mus. Bull. 104, Pt. 4, p. 163, pl. 42, figs. 3, 4.
——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 49, pl. 9, fig. 7.
——— Cushman and Ponton, 1932, idem., Bull. 9, p. 86.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 27, pl. 9, fig. 3.
——— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 200, pl. 13, fig. 47.

Typical specimens of this species occur at the *Arca* facies locality no. 25 and the *Ecphora* facies locality no. 39.

Uvigerina parkeri Karrer

Plate 17, figs. 8, 9

Uvigerina parkeri Karrer, 1877, Abhandl. K. K. Geol. Reichs., vol. 9, p. 385, pl. 16b, fig. 50.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 86, pl. 12, figs. 12a, b.

This very much compressed form with the later portion biserial is quite common in the *Ecphora* facies localities nos. 41, 45, 46 and 47. Since it has not been found in any other part of the section, it should prove to be a good marker of the *Ecphora* facies.

Uvigerina peregrina Cushman

Uvigerina pygmaea Flint (not d'Orbigny), 1897 (1899), Rept. U. S. Nat. Mus. p. 320, pl. 68, fig. 2.

Uvigerina peregrina Cushman, 1923, U. S. Nat. Mus. Bull. 104, pt. 4, p. 166, pl. 42, figs. 7-10.

———— Cushman, 1927, Bull. Scripps Instit. Oceanography, Tech. ser., vol. 1, No. 10, p. 158, pl. 3, fig. 13.

———— Galloway and Wissler, 1927, Jour. Paleontology, vol. 1, p. 76, pl. 12, figs. 1, 2.

———— Cushman, Stewart and Stewart, 1930, Trans. San Diego Soc. Nat. Hist., vol. 6, p. 69, pl. 5, fig. 11.

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

Uvigerina peregrina Cushman and Ponton, 1932, idem., Bull. 9, p. 85.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; *Ecphora* facies localities nos. 37, 38, 39; and *Cancellaria* facies localities nos. 49, 57 and 58. This species is very common in the Choctawhatchee Stage.

Genus SIPHOGENERINA Schlumberger, 1883

Siphogenerina lamellata Cushman

Plate 16, fig. 8

Siphogenerina lamellata Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 55, pl. 12, fig. 3.

———— Cushman, 1926, Proc. U. S. Nat. Mus., vol. 67, p. 10, pl. 1, fig. 13.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 49, pl. 9, fig. 10.

———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 28, pl. 9, fig. 4.

———— Renz, 1948, Geol. Soc. Am. Mem. 32, p. 165, pl. 7, fig. 25.

———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, pp. 221, 222, pl. 14, figs. 9, 10.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32, 35.

Genus ANGULOGERINA Cushman, 1927

Angulogerina occidentalis (Cushman)

Plate 22, figs. 7, 8

Uvigerina angulosa Cushman, 1922 (not Williamson), Carnegie Instit. Washington Publ. 311, p. 34, pl. 5, figs. 3, 4.

Uvigerina occidentalis Cushman, 1923, U. S. Nat. Mus. Bull. 104, Pt. 4, p. 169.

Angulogerina occidentalis Cushman, 1932, Contr. Cushman Lab. Foram. Res., vol. 8, p. 46, pl. 6, figs. 15, 16.

———— Bermudez, 1949, idem., Special Publ. 25, p. 218, pl. 13, fig. 57.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30; *Ecphora* facies localities nos. 37, 38, 39; and the *Cancellaria* facies localities nos. 52, 53, 54, 55, 57, and 58.

TABLE 6

DISTRIBUTION OF BULIMINIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Buliminella curta					—	—	
Buliminella elegantissima	—				—	—	—
Buliminella sp.	—						
Bulimina elongata			—				
Bulimina inflata					—	—	
Bulimina marginata					—		—
Bulimina ovata					—		
Fissurina cf. F. marginato-perforata	—	—	—		—	—	—
Fissurina orbignyana lacunata						—	—
Fissurina cf. F. striato-punctata						—	—
Oolina hexagona					—	—	—
Oolina hexagona scalariformis						—	—
Oolina quadrata							—
Virgulina fusiformis						—	—
Virgulina pontoni	—				—		
Virgulina punctata						—	—
Virgulina sp.	—						
Virgulina (Virgulinella) gunteri					—		—
Virgulina (Virgulinella) gunteri curtata	—					—	
Virgulina (Virgulinella) miocenica	—				—	—	
Bolivina advena					—		
Bolivina floridana					—	—	
Bolivina marginata	—				—		
Bolivina marginata multicosta					—		—
Bolivina robusta			—				
Bolivina paula	—				—	—	—
Bolivina plicatella	—	—	—		—	—	—
Bolivina plicatella mera	—	—					
Bolivina pulchella primitiva						—	—
Bolivina sp. A.					—		
Bolivina sp. B.	—						
Loxostoma gunteri					—		
Reussella spinulosa	—	—			—	—	—
Reussella cf. R. rectimargo	—						
Reussella sp.							—
Pavonina miocenica							—
Chrysalidinella pulchella					—	—	—
Uvigerina auberiana					—	—	
Uvigerina parkeri						—	
Uvigerina peregrina					—	—	—
Siphogenerina lamellata					—		
Angulogerina occidentalis					—	—	—

Family ELLIPSOIDINIDAE

Genus PARAFISSURINA Parr, 1947

Parafissurina bidens (Cushman)

Ellipsolagena bidens Cushman, 1930, Florida Geol. Survey Bull. 4, pp. 50-51, pl. 9, figs. 11a-b.

——— Cushman and Ponton, 1932, idem., Bull. 9, p. 87.

This species occurs frequently at the *Arca* facies localities nos. 25, 27, 28, 30, 32 and the *Ecphora* facies localities nos. 36 and 37.

Parafissurina marginata (Walker and Jacob)

Plate 26, fig. 9

Serpula (Lagena) marginata Walker and Jacob, 1784, Test. Min., p. 3, pl. 1, fig. 7.

Vermiculum marginatum, Montfort, 1803, Test. Brit., p. 524.

Oolina compressa d'Orbigny, 1839, Voyage Amerique Meridionale, Pt. 5, p. 18, figs. 1, 2.

Lagenula marginata Thorpe, 1844, Brit. Marine Conch. p. 234.

Entosolenia marginata Williamson, 1848, Ann. and Mag. Nat. History, ser. 2, vol. 1, p. 17, figs. 15-17.

——— Williamson, 1858, Rec. Foram. Gt. Britain, pp. 9, 10, figs. 19-28.

Lagena marginata Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 63, pl. 8, fig. 13.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 37, 38; and the *Cancellaria* facies locality no. 53.

Family CASSIDULINIDAE

Genus CASSIDULINA d'Orbigny, 1826

Cassidulina crassa d'Orbigny

Plate 23, figs. 3, 4

Cassidulina crassa d'Orbigny, 1839, Foram. Amerique Meridionale, p. 56, pl. 7, figs. 18-20.

——— d'Orbigny, 1846, Foram. foss. Vienne, p. 213, pl. 21, figs. 42, 43.

Cassidulina oblonga Reuss, 1850, Denkschr. K. Akad. Wiss. Wien, vol. 1, p. 376, pl. 48, figs. 5-6.

Cassidulina crassa H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 429, pl. 54, fig. 5.

——— Cushman, 1911, U. S. Nat. Mus. Bull. 71, Pt. 2, p. 97, fig. 151.

——— Cushman, 1922, idem, Bull. 104, Pt. 3, p. 124, pl. 26, fig. 7.

——— Cushman, 1924, Contr. Cushman Lab. Foram. Res., vol. 1, Pt. 1, p. 54, pl. 8, figs. 37-39.

——— Cushman, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 100, pl. 14, figs. 10a, b.

——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 58, pl. 11, figs. 6a, b.

——— Cushman and Ponton, 1932, idem., Bull. 9, p. 97.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 28; *Ecphora* facies localities nos. 37, 38, 40; and at the *Cancellaria* facies localities nos. 49, 58.

Cassidulina chipolensis Cushman and Ponton
Plate 8, figs. 1, 2, 3

Cassidulina chipolensis Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 98, pl. 15, figs. 2a-c.

Typical specimens of this species occur at the Chipola facies locality no. 12.

Cassidulina laevigata carinata Cushman
Plate 23, figs. 5, 6

Cassidulina laevigata var. *carinata* Cushman, 1922, U. S. Nat. Mus. Bull. 104, Pt. 3, p. 124, pl. 25, figs. 6, 7.

———— Cushman, 1925, Contr. Cushman Lab. Foram. Res., vol. 1, Pt. 3, p. 52, pl. 8, figs. 11, 12.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 58, pl. 11, fig. 7.

———— Cole, 1931, idem., Bull. 6, p. 54, pl. 4, fig. 4.

———— Cushman and Parker, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 14, pl. 2, fig. 14.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 97.

———— Nuttall, 1932, Jour. Paleontology, vol. 6, p. 27, pl. 6, fig. 8.

———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 33, pl. 12, fig. 3.

———— Ellisor, 1940, Bull. Am. Assoc. Petroleum Geologists, vol. 24, pl. 6, fig. 4.

———— Cushman and Todd, 1945, Cushman Lab. Foram. Res. Special Publ. 15, p. 62, pl. 10, fig. 11.

Typical specimens of this series occur at the *Arca* facies localities nos. 24, 26, 30; *Ecphora* facies localities nos. 37, 38; and at the *Cancellaria* facies locality no. 54.

Genus ORTHOPLECTA H. B. Brady, 1884
Orthoplecta sp.

This species is reported from the *Arca* facies locality no. 27. It is represented by a few specimens only and is probably undescribed. Until further specimens are found, it is thought best not to describe it.

Genus CASSIDULINOIDES Cushman, 1927
Cassidulinoides bradyi (Norman)
Plate 23, figs. 9, 10

Cassidulina bradyi Norman, 1880, Ms. in Wright, Proc. Belfast Nat. Field Club, p. 152.

Bulimina squammosa d'Orbigny, var. *subsquammosa* Goës, 1882 (not Egger) (part), Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, p. 69, pl. 4, figs. 111-113(?) (not 109, 110).

Cassidulina bradyi H. B. Brady, 1884, *Challenger* Rept., Zoology, vol. 9, p. 431, pl. 54, figs. 6-9 (not fig. 10).

———— Goës, 1894, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, p. 44, pl. 8, figs. 423-426.

—————— Cushman, 1911, U. S. Nat. Mus. Bull. 71, Pt. 2, p. 99, text fig. 153.
—————— Cushman, 1922, idem., Bull. 104, Pt. 3, p. 128, pl. 23, figs. 6, 7.
—————— Cushman, 1925, Contr. Cushman Lab. Foram. Res., vol. 1, p. 52, pl. 8, figs. 3-5.
Cassidulinoides bradyi Cushman, 1930, Florida Geol. Survey Bull. 4, p. 58, pl. 11, fig. 8.
—————— Cushman and Ponton, 1932, idem., Bull. 9, p. 98.
—————— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 33, pl. 12, fig. 4.
—————— Phleger, 1939, Geol. Soc. America, vol. 50, p. 1421, pl. 2, fig. 8.
—————— Ellisor, 1940, Bull. Am. Assoc. Petroleum Geologists, vol. 24, pl. 6, fig. 5.
—————— LeRoy, 1941, Quart. Colorado School Mines, vol. 36, No. 1, Pt. 2, p. 85, pl. 6, figs. 18, 19.
—————— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 270, pl. 29, figs. 29-31.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and at the *Ecphora* facies locality no. 41.

TABLE 7

DISTRIBUTION OF CASSIDULINIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Cassidulina crassa					——	——	——
Cassidulina chipolensis	——						
Cassidulina laevigata carinata					——	——	——
Orthoplecta sp.					——		
Cassidulinoides bradyi					——	——	

Family CHILOSTOMELLIDAE
Subfamily CHILOSTOMELLINAE
Genus CHILOSTOMELLA Reuss, 1850
Chilostomella oolina Schwager

Chilostomella oolina Schwager, 1878, Boll. com. Geol. Ital., vol. 9, p. 527, pl. 1, fig. 16.
—————— Cushman, 1926, Contr. Cushman Lab. Foram. Res., vol. 1, pt. 4, p. 74, pl. 11, figs. 3-10.
—————— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 59.
—————— Cushman and Ponton, 1932, idem., Bull. 9, p. 98.

Typical specimens of this species occur at the *Arca* localities nos. 32 and 35. So far as it is known, this species has not been reported from any other part of the section.

Subfamily ALLOMORPHINELLINAE

Genus PULLENIA Parker and Jones, 1862

Pullenia sp.

This small form occurs rarely at the *Arca* facies locality no. 30. Further material may establish its specific determination.

Superfamily ROTALIIDEA

Family SPIRILLINIDAE

Subfamily SPIRILLININAE

Genus PLANISPIRILLINA Bermudez, 1952

Planispirillina orbicularis (Bagg)

Plate 20, figs. 1, 2

Spirillina orbicularis Bagg, 1898, Bull. Am. Paleontology, vol. 2, No. 10, p. 33 (327), pl. 2 (22), figs. 2a, b, c.

———— Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 58, pl. 14, fig. 1.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 51, pl. 9, figs. 12a, b.

Typical specimens of this species occur at the *Arca* facies localities nos. 31, 34, 35; and at the Ecphora facies localities nos. 36 and 47.

Subfamily PATELLININAE

Genus PATELLINA Williamson, 1858

Patellina corrugata Williamson

Plate 19, figs. 7, 8

Patellina corrugata Williamson, 1858, Recent Foram. Gt. Britain, p. 46, pl. 3, figs. 86-89.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 87, pl. 13, figs. 1a, b.

Typical specimens of this species occur rarely at the *Cancellaria* facies locality no. 52.

Family ROTALIIDAE

Subfamily DISCORBISINAE

Genus DISCORBIS Lamarck, 1804

Discorbis candeiana (d'Orbigny)

Rosalina candeiana d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 97, pl. 4, figs. 2-4.

Truncatulina candeiana Cushman, 1921, Proc. U. S. Nat. Mus., vol. 59, p. 57, pl. 13, figs. 4, 5.

———— Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 47, pl. 6, figs. 7-9.

Discorbis vilardeboana Cushman (not d'Orbigny), 1930, Florida Geol. Survey Bull. 4, p. 52, pl. 10, figs. 3a-c.

Discorbis candeiana Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 19, pl. 7, figs. 4a-c.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 88, 89, pl. 13, figs. 14a-c.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 4, 5, 6, 7, 8, 9, 10, 13; and the *Cancellaria* facies locality no. 49.

Discorbis candeiana bullata Cushman and Ponton

Plate 7, figs. 5, 6, 7

Truncatulina cora Cushman (not d'Orbigny), 1922, Carnegie Instit. Washington, Publ. 311, p. 48, pl. 7, figs. 3-5.

Discorbis candeiana (d'Orbigny), var. *bullata* Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 89, pl. 13, figs. 5a-c.

This variety differs from the typical species in having almost globular chambers in the adult and a lobulate periphery. It is recorded from the Chipola facies localities nos. 1, 3, 4, 5, 6, 7, 8, 9, 10 and 13.

Discorbis consobrina (d'Orbigny)

Plate 24, figs. 4, 5, 6

Rosalina consobrina d'Orbigny, 1839, Voyage Amerique Meridionale, vol. 5, Pt. 5, p. 46, pl. 7, figs. 4-6.

Discorbis consobrina Cushman and Kellett, 1929, Proc. U. S. Nat. Mus., vol. 75, Art. 25, p. 10, pl. 4, figs. 1, 2.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 53, pl. 10, figs. 4a-c.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 88, pl. 13, figs. 3a-c.

Typical specimens of this species occur at the *Arca* facies locality no. 25; *Ecphora* facies localities nos. 38, 39, 40; and the *Cancellaria* facies localities nos. 49, and 58.

Discorbis floridana Cushman

Plate 24, figs. 7, 8, 9

Discorbis floridana Cushman, 1922, Carnegie Instit. Washington Publ. 311, p. 39, pl. 5, figs. 11, 12.

Discorbis subaraucana Cushman, 1930 (not Cushman, 1922), ibid., p. 52, pl. 10, figs. 1a-c.

Discorbis floridana Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 21, pl. 4, figs. 7, 8.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 88, pl. 13, figs. 2a, c.

———— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 238, pl. 15, figs. 16-18.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 30; and the *Cancellaria* facies localities nos. 48, 49, 53, and 58.

Discorbis terquemi (Rzehak)

Rosalina orbicularis Terquem, 1876, Anim., sur la Plage de Dunkerque, p. 75, pl. 9, figs. 4a, b.

Discorbis orbicularis Berthelin, 1878, Foram. de Borgneuf et Pornichet, p. 39, No. 63.

Discorbina orbicularis H. B. Brady. 1884, *Challenger* Rept., vol. 9, p. 647, pl. 88, figs. 4-8.
Discorbis orbicularis Cushman, 1915, U. S. Nat. Mus. Bull. 71, Pt. 5, p. 16, pl. 11, fig. 1.
——— Cushman, 1921, idem., Bull. 100, Pt. 4, p. 305.
——— Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 38, pl. 5, fig. 10.
Discorbis mira Cushman, 1930, Florida Geol. Survey Bull. 4, p. 52, pl. 10, figs. 2a-c.
Discorbis orbicularis Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 27, pl. 6, figs. 3a-c.
——— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 89, 90, pl. 13, figs. 6a-c.
Discorbina terquemi Rzehak (*new name*), 1888, Geol. Reichsanst. Verh., Austria, no. 11, p. 228.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 5, 10; *Arca* facies localities nos. 24, 26, 27, 28; *Ecphora* facies locality no. 37; and the *Cancellaria* facies localities nos. 50, 53, 54, 55, and 57.

Discorbis valvulata (d'Orbigny)

Rosalina valvulata d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 271, No. 4.
——— d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 96, pl. 3, figs. 21-23.
——— d'Orbigny, 1839, in Barker, Webb and Berthelot, Hist., Nat. Iles Canaries, Foraminifères, p. 136, pl. 2, figs. 19-21.
Discorbina valvulata Goës, 1882, Kongl. Svensk. Vet.-Akad. Handl., vol. 19, No. 4, p. 106, pl. 8, figs. 258-261.
Discorbis valvulata Cushman, 1921, Proc. U. S. Nat. Mus., vol. 59, p. 59, pl. 14, figs. 4, 5.
——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 53, pl. 10, figs. 5a-c.
——— Cushman and Ponton, 1932, idem. Bull. 9, p. 90.

Typical specimens of this species occur at the Chipola facies localities nos. 2, 7; *Arca* facies locality no. 24; and the *Cancellaria* facies localities nos. 50, and 53.

Discorbis sp.

This species occurs at the Chipola facies localities nos. 1 and 6. It is apparently a juvenile form but it does not show any resemblance with the adults of species of *Discorbis* that are associated with it.

Genus DISCOPULVINULINA Hofker, 1951

Discopulvinulina bertheloti floridensis (Cushman)

Discorbina globularis Flint (not Karrer), 1897 (1899), Ann. Rept. U. S. Nat. Mus., p. 327, pl. 72, fig. 2.
Discorbis bertheloti (d'Orbigny) var. *floridensis* Cushman, Ms. in Cushman and Jarvis, 1930, Jour. Paleontology, vol. 4, p. 364, pl. 33, fig. 13.
——— Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 17, pl. 3, figs. 3-5.
——— Cushman, 1944, Cushman Lab. Foram. Res. Special Publ. 12, p. 31, pl. 4, fig. 17.
——— Cushman and Todd, 1945, idem., Special Publ. 15, p. 56, pl. 8, figs. 15, 16.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 26, 28 and 31.

Genus VALVULINERIA Cushman, 1926

Valvulineria floridana Cushman

Plate 29, figs. 8, 9, 10

Valvulineria floridana Cushman, 1930, Florida Geol. Survey Bull. 4, p. 54, pl. 10, figs. 6a-c.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 91.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 27, 30, 32, and *Cancellaria* facies locality no. 58. Cushman and Ponton (1932, p. 91) also report it from one *Ecphora* facies locality and also from the Shoal River and the Chipola. Present studies show that it is restricted to the Choctawhatchee Stage; earlier records of it from the Chipola and the Shoal River are uncertain.

Genus BAGGINA Cushman, 1926

Baggina sp.

This species is represented by a couple of specimens from the Chipola facies locality no. 1. The material does not permit a specific identification.

Genus EPONIDES Montfort, 1808

Eponides antillarum (d'Orbigny)

Rotalina antillarum d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 75, pl. 5, figs. 4-6.

Truncatulina antillarum Fornasini, 1902, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 10, p. 63.

———— Cushman, 1921, U. S. Nat. Mus. Proc., vol. 59, p. 57, pl. 13, figs. 6-8.

Pulvinulina incerta Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 51, pl. 9, figs. 1-3.

Eponides antillarum Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 42, pl. 9, figs. 2a-c.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 93, pl. 14, figs. 1a-c.

Typical specimens of this species occur at the Chipola facies locality nos. 3, 4, 6, 10; *Arca* facies locality no. 25; and the *Ecphora* facies locality no. 37.

Eponides repandus (Fichtel and Moll)

Plate 7, figs. 8, 9, 10

Nautilus repandus Fichtel and Moll, 1798, Test. Micr., p. 35, pl. 3, figs. a-d.

Eponides repandus Montfort, 1808, Conch. Syst., vol. 1, p. 127, 32e genre.

Pulvinulina repanda H. B. Brady, 1884, *Challenger* Rept., Zoology, vol. 9, p. 684, pl. 104, fig. 18.

Eponides repandus Cushman, 1927, Contr. Cushman Lab. Foram. Res., vol. 3, pl. 16, fig. 9.

Eponides repandus Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 92, pl. 13, fig. 9.
———— Galloway and Heminway, 1941, New York Acad. Sci., vol. 3, Pt. 4, p. 375, pl. 17, fig. 3.
———— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 248, pl. 17, figs. 13-15.

Typical specimens of this species occur at the Chipola facies locality no. 7.

Eponides sp.

This species is represented by a few broken tests from the *Arca* facies locality no. 24.

Genus BUCCELLA Andersen, 1952

Buccella mansfieldi (Cushman)

Plate 25, figs. 1, 2, 3

Eponides mansfieldi Cushman, 1930, Florida Geol. Survey Bull. 4, p. 54, pl. 11, figs. 1a-c.
———— Cushman, 1932, idem., Bull. 9, p. 92.
Buccella mansfieldi Andersen, 1952, Jour. Washington Acad. Sci., vol. 42, no. 5, pp. 148, 149, figs. 12a, b; 13a-c.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 28, 31, 32; and at the *Cancellaria* facies locality no. 58.

Genus POROEPONIDES Cushman, 1944

Poroeponides lateralis (Terquem)

Plate 24, figs. 10, 11, 12

Rosalina lateralis Terquem, 1878, Mem. Soc. Geol. France, ser. 1, vol. 4, p. 25, pl. 2(7), figs. 11a-c.
Pulvinulina lateralis H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 689, pl. 106, figs. 2, 3.
———— Cushman, 1908, Proc. Boston Soc. Nat. Hist., vol. 34, p. 30, pl. 5, figs. 11, 12.
———— Sidebottom, 1909, Mem. Proc. Manchester Lit. Phil. Soc., vol. 53, No. 21, p. 5, pl. 2, fig. 6; pl. 3, figs. 1, 2.
———— Heron-Allen and Earland, 1915, Trans. Zool. Soc., vol. 20, p. 714, pl. 53, figs. 6-11.
———— Cushman, 1921, U. S. Nat. Mus. Bull. 100, Pt. 4, p. 336, pl. 69, figs. 2a-c.
Eponides lateralis Cushman, 1930, Florida Geol. Survey Bull. 4, p. 55, pl. 10, figs. 7a-c.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 92, pl. 13, figs. 8a-c.
Poroeponides lateralis Cushman, 1944, Cushman Lab. Foram. Res. Special Publ. 12, p. 34, pl. 4, fig. 23.
———— Cushman, 1948, Foraminifera, pl. 52, fig. 14.

Typical specimens of this species occur at the *Arca* facies locality no. 24 and the *Cancellaria* facies localities nos. 48, 49 and 54.

Genus EPISTOMINELLA Husezima and Maruhasi, 1944

Epistominella pontoni (Cushman)

Plate 27, figs. 9, 10, 11

Pulvinulinella pontoni Cushman, 1930, Florida Geol. Survey Bull. 4, p. 57, pl. 11, figs. 2a-c.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 97.

This species occurs at the following localities: *Arca* facies localities nos. 26, 28, 30; *Ecphora* facies locality no. 38; and *Cancellaria* facies localities nos. 49, 54 and 58. Cushman and Ponton (1932, p. 97) also recorded it from the Shoal River but it is more abundant in the Choctawhatchee Stage.

Genus CANCRIS Montfort, 1808

Cancris sagra (d'Orbigny)

Rotalnia sagra, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 77, pl. 5, figs. 13-15.

Pulvinulina oblonga H. B. Brady, Parker and Jones, 1888 (not Williamson), Trans. Zool. Soc. London, vol. 12, p. 229, pl. 46, fig. 5.

Pulvinulina semipunctata Cushman, 1922, Carnegie Inst. Washington, Publ. 311, p. 51, pl. 8, figs. 5, 6.

Cancris sagra Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 74, pl. 15, fig. 2.

———— Cushman and Todd, 1942, Contr. Cushman Lab. Foram. Res., vol. 18, p. 77, pl. 19, figs. 3-7.

———— Bermudez, 1949, idem., Special Publ. 25, p. 256, pl. 18, figs. 28-30.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 4, 7, 9; *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; *Ecphora* facies localities nos. 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 48, 49, 50, 52, 57, and 58.

Subfamily EPISTOMININAE

Genus ASTERIGERINA d'Orbigny, 1839

Asterigerina carinata d'Orbigny

Asterigerina carinata d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 118, pl. 5, fig. 25.

———— Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 77, pl. 15, figs. 4, 5.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 94.

———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 265, pl. 19, figs. 31-33.

Typical specimens of this species occur at the Chipola facies localities nos. 4 and 9.

Asterigerina miocenica Cushman and Ponton

Plate 11, figs. 8, 9, 10

Asterigerina miocenica Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 95, pl. 14, figs. 4a-c.

Typical specimens of this species occur at the Oak Grove facies localities nos. 14 and 15.

Subfamily SIPHONININAE
Genus SIPHONINA Reuss, 1850
Siphonina jacksonensis limbosa Cushman
Plate 10, figs. 11, 12, 13

Siphonina jacksonensis Cushman and Applin, var. *limbosa* Cushman, 1927, Proc. U. S. Nat. Mus., vol. 72, Art. 20, p. 5, pl. 4, fig. 2.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 94, pl. 14, figs. 2a-c.

This variety is characterized by its keeled and serrate periphery and very limbate sutures. It is recorded from the Shoal River facies localities nos. 17, 18, 19 and is an excellent marker for the Shoal River facies.

Subfamily ROTALIINAE
Genus ROTORBINELLA Bandy, 1944
Rotorbinella? rosacea (d'Orbigny)
Plate 24, figs. 1, 2, 3

Rotalia rosacea (d'Orbigny), 1826, Ann. Sci. Nat., vol. 7, p. 273, No. 15.
Discorbina rosacea Jones, Parker and Brady, 1866, pl. 4, fig. 17.
———— H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 644, pl. 89, figs. 1, 4.
Discorbis rosacea Cushman, 1915, U. S. Nat. Mus. Bull. 71, Pt. 5, p. 13, fig. 13.
———— Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 59, pl. 14, fig. 4.

Typical specimens of this species occur at the *Arca* facies locality no. 24; and the *Cancellaria* facies localities nos. 48 and 57.

Genus STREBLUS Fischer, 1817
Streblus beccarii parkinsoniana (d'Orbigny)

Rosalina parkinsoniana d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 99, pl. 4, figs. 25-27.
Rotalia beccarii (Linné) var. *parkinsoniana* Cushman and Cole, 1930, Contr. Cushman Lab. Foram. Res., vol. 6, p. 100, pl. 13, fig. 14.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 56, pl. 11, figs. 3a-c.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 93.
Streblus beccarii (Linné), var. *parkinsoniana* Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 233, pl. 15, figs. 43-45.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 4, 5, 13, 14; the Oak Grove facies localities nos. 15, 16; the Shoal River facies localities nos. 17, 18, 19, 20; the *Arca* facies locality no. 24; and the *Cancellaria* facies localities nos. 49, 55 and 58.

Streblus beccarii tepida (Cushman)

Rotalia beccarii (Linné) var. *tepida* Cushman, 1926, Carnegie Instit. Washington, Publ. 344, p. 79, pl. 1.
———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 234, pl. 15, figs. 49-51.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 36, 39; and at the *Cancellaria* facies localities nos. 48, 53 and 57.

Streblus sp.

Fragmentary specimens of a *Streblus* are recorded from the Chipola locality no. 9. These may represent broken tests of *Streblus beccarii parkinsoniana* (d'Orbigny).

TABLE 8

DISTRIBUTION OF ROTALIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Discorbis candeiana	—						—
Discorbis candeiana bullata	—						
Discorbis consorbrina					—	—	—
Discorbis floridana					—		—
Discorbis orbicularis	—				—	—	—
Discorbis valvulata	—				—		—
Discorbis sp.	—						
Discopulvinulina bertheloti floridensis					—		
Valvulineria floridana	—		—		—	—	—
Baggina sp.	—						
Eponides antillarum	—				—	—	
Eponides repandus	—						
Eponides sp.					—		
Buccella mansfieldi					—		—
Poroeponides lateralis					—		—
Epistominella pontoni			—		—	—	—
Cancris sagra	—				—	—	—
Asterigerina carinata	—						
Asterigerina miocenica		—					
Siphonina jacksonensis limbosa			—				
Rotorbinella ? rosacea					—		—
Streblus beccarii parkinsoniana	—	—	—		—		—
Streblus beccarii						—	—
Streblus sp.	—						

Family CERATOBULIMINIDAE

Genus LAMARCKINA Berthelin, 1881

Lamarckina atlantica Cushman

Plate 10, figs. 8, 9, 10

Lamarckina atlantica Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 35, pl. 7, fig. 7.

———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 91, pl. 13, fig. 7.
———— Cushman and Todd, 1945, Cushman Lab. Foram. Res., Special Publ. 15, p. 56, pl. 9, fig. 1.
———— Bermudez, 1949, idem., Special Publ. 25, p. 241, pl. 16, figs. 13-15.

Typical specimens of this species occur at the Shoal River facies localities nos. 17 and 20.

Subfamily Robertininae
Genus Robertina d'Orbigny, 1846
Robertina subteres (H. B. Brady)
Plate 19, figs. 5, 6

Bulimina presli Reuss, var. *elegantissima* Parker and Jones, 1865, Philos. Trans., vol. 155, p. 374, pl. 15, figs. 12-17.
Bulimina elegantissima var. H. B. Brady, 1878, Ann. and Mag. Nat. History, ser. 5, vol. 1, p. 436, pl. 20, fig. 12.
Bulimina subteres H. B. Brady, 1881, Quart. Jour. Micr. Sci., vol. 21, p. 55.
———— J. Wright, 1880-1881, Proc. Belfast Nat. Field Club, App., p. 180, pl. 8, figs. 2, 2a.
———— H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 403, pl. 50, figs. 17, 18.
———— Egger, 1893, Abh. kön. bay. Akad. Wiss. München, Cl 2, vol. 18, p. 289, pl. 8, figs. 73, 74.
———— Goës, 1894, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, p. 46, pl. 9, figs. 445-453.
———— Chapman, 1909, Rept. Foram. Subantarctic Ids. New Zealand, p. 330, pl. 14, fig. 10.
———— Bagg, 1912, U. S. Geol. Survey Bull. 513, p. 39, pl. 9, figs. 7a-d; pl. 11, figs. 1-5.
———— Heron-Allen and Earland, 1913, Proc. Roy. Irish Acad., vol. 31, Pt. 64, p. 62, pl. 4, figs. 13, 14.
Buliminella subteres Cushman, 1911, U. S. Nat. Mus. Bull. 71, Pt. 2, p. 89, figs. 142a, b.
———— Cushman, 1922, idem., Bull. 104, Pt. 3, p. 110, pl. 22, figs. 3-5.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 76, pl. 11, figs. 9a, b.

Typical specimens of this species occur at the *Cancellaria* facies locality no. 52.

Family Anomalinidae
Subfamily Cibicidinae
Genus Cibicides Montfort, 1808
Cibicides floridanus (Cushman)

Truncatulina floridana Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 62, pl. 19, fig. 2.
———— Nuttall, 1928, Quart. Jour. Geol. Soc. London, vol. 84, p. 98, pl. 7, figs. 14, 16.
Cibicides floridanus Cushman, 1930, Florida Geol. Survey Bull. 4, p. 61, pl. 12, fig. 3.
———— Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 122, pl. 23, figs. 3-5.
———— Cushman and Laiming, 1931, Jour. Paleontology, vol. 5, p. 119, pl. 14, fig. 8.

―――――― Cushman and Parker, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, p. 16, pl. 3, fig. 2.
―――――― Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 100.
―――――― Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 34, pl. 13, fig. 1.
―――――― Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 334, pl. 44, fig. 10.
―――――― Ellisor, 1940, Bull. Am. Assoc. Petroleum Geologists, vol. 24, pl. 6, fig. 10.
―――――― Galloway and Heminway, 1941, New York Acad. Sci. vol. 3, Pt. 4, p. 392, pl. 23, fig. 2.
―――――― LeRoy, 1941, Quart. Colorado School Mines, vol. 36, Pt. 2, p. 88, pl. 3, figs. 10-12.
―――――― Cushman and Frizzell, 1943, Contr. Cushman Lab. Foram. Res. vol. 19, p. 88, pl. 15, figs. 11, 12.
―――――― Cushman and Todd, 1945, idem., Special Publ. 15, p. 71, pl. 12, fig. 8.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 6; *Arca* facies localities nos. 24, 27, 30, *Ecphora* facies localities nos. 37, 38, 39; and *Cancellaria* facies localities nos. 48, 49, 52, 55, 57, and 58.

Cibicides lobatulus (Walker and Jacob)

Nautilus lobatulus Walker and Jacob, 1798, Adams Essays, Kanm. ed., p. 642, pl. 14, fig. 36.
Truncatulina tuberculata d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 279, mod. 37.
Truncatulina lobatula (Walker and Jacob) d'Orbigny, 1846, Foram. Foss. Vienne, p. 168, pl. 9, figs. 18-23.
Anomalina variolata d'Orbigny, 1846, ibid., p. 170, pl. 9, figs. 27-29.
Truncatulina communis Reuss, 1855, Sitz. Akad. Wiss. Wien, vol. 18, p. 242, pl. 5, fig. 56.
Truncatulina dekayi Reuss, 1861, idem., vol. 44, p. 338, pl. 7, fig. 6.
Truncatulina lobatula Brady, 1884, *Challenger* Rept., vol. 9, p. 660, pl. 115, figs. 4, 5.
―――――― Cushman, 1910, U. S. Nat. Mus. Bull. 71, Pt. 5, p. 31, pl. 15, fig. 1.
Cibicides lobatulus (Walker and Jacob) Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 118, pl. 21, figs. 3a-c.

Typical specimens of this species occur at the Chipola facies localities nos. 5, 14.

Cibicides refulgens Montfort

Cibicides refulgens Montfort, 1808, Conchyliologie systématique, vol. 1, p. 122.
Truncatulina refulgens d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 279, pl. 13, figs. 8-11, mod. 77.
―――――― H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 659, pl. 92, figs. 7-9.
―――――― Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 61, pl. 18, fig. 3.
Cibicides refulgens Cushman, 1930, Florida Geol. Survey Bull. 4, p. 62.
―――――― Cushman and Ponton, 1932, idem., Bull. 9, p. 101.
―――――― Cushman, 1933, Cushman Lab. Foram. Res., Special Publ. 5, p. 36, fig. 10.
―――――― Cushman, 1940, Foraminifera, 3rd ed., Key, pl. 36, fig. 10.

———— Cushman, 1942, Reports of the Great Barrier Reef Committee, vol. 5, p. 113, pl. 12, fig. 3.
———— Cushman and Todd, 1945, Cushman Lab. Foram. Res. Special Publ. 15, p. 70, pl. 12, fig. 6.

Typical specimens of this species occur at the Chipola facies locality no. 10.

Genus RECTOCIBICIDES Cushman and Ponton, 1932
Rectocibicides miocenicus Cushman and Ponton
Plate 19, figs. 12, 13

Pavonina sp.(?) Cushman, 1930, Florida Geol. Survey Bull. 4, p. 41.
Rectocibicides miocenicus Cushman and Ponton, 1932, idem., Bull. 9, pp. 103, 104, pl. 16, figs. 2-4.

Typical specimens of this species occur at the *Cancellaria* facies localities nos. 48, 50 and 58. It is an excellent marker for the *Cancellaria* facies of the Choctawhatchee Stage.

Genus HANZAWAIA Asano, 1944
Hanzawaia concentrica (Cushman)
Plate 12, figs. 7, 8, 9

Truncatulina concentrica Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 64, pl. 21, fig. 3.
Cibicides concentricus Cushman, 1930, Florida Geol. Survey Bull. 4, p. 61, pl. 12, fig. 4.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 101.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 35, pl. 13, fig. 3.
———— Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 334, pl. 44, fig. 9.
———— D. K. Palmer, 1941, Mem. Soc. Cubana Hist. Nat., vol. 15, p. 294, pl. 30, fig. 2.
———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 296, pl. 26, figs. 7-12.

Typical specimens of this species occur at the following localities: Chipola facies localities nos. 1, 4, 6, 8, 10, 13; *Arca* facies localities nos. 24, 25, 26, 27, 28, 30; *Ecphora* facies localities nos. 37, 38, 39, 40; and *Cancellaria* facies localities nos. 48, 49, 52, 53, 54, 55, 57 and 58.

Genus CIBICIDELLA Cushman, 1927
Cibicidella variabilis (d'Orbigny)
Plate 8, figs. 4, 5, 6

Truncatulina variabilis d'Orbigny, 1839, in Barker, Webb and Berthelot, Hist. Nat. Iles Canaries, vol. 2, Pt. 2, Foraminifères, p. 135, pl. 2, fig. 29.
Cibicidella variabilis Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 127, pl. 24, fig. 3.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 102, pl. 15, figs. 5, 6, 7.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 2, 5, and 11.

Genus DYOCIBICIDES Cushman and Valentine, 1930

Dyocibicides biserialis Cushman and Valentine

Dyocibicides biserialis Cushman and Valentine, 1930, Contr. Dept. Geol. Stanford Univ., vol. 1, No. 1, p. 31, pl. 10, figs. 1, 2.

———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 62, pl. 12, figs. 6a, b.

———— Cushman, 1930, Contr. Cushman Lab. Foram. Res., vol. 6, pl. 12, fig.12.

———— Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 126, pl. 24, fig. 2.

———— Cushman and Parker, 1931, U. S. Nat. Mus. Proc., vol. 80, Art. 3, p. 22, pl. 4, fig. 8.

———— Cole, 1931, Florida Geol. Survey Bull. 6, p. 57, pl. 5, figs. 11, 12.

———— Cushman and Ponton, 1932, idem., Bull. 9, p. 102.

———— Cushman and Todd, 1945, Cushman Lab. Foram. Res., Special Publ. 15, p. 72, pl. 12, fig. 10.

Typical specimens of this species occur at the Chipola facies locality no. 3; the *Arca* facies localities nos. 24, 25, 27, 28, 30, 32; the Ecphora facies locality no. 37; and the *Cancellaria* facies localities nos. 48, 49, 50, 52, 53, 54, 55, and 58.

Genus CYCLOLOCULINA Heron-Allen and Earland, 1908

Cycloloculina miocenica Cushman and Ponton

Plate 13, figs. 1, 2

Cycloloculina miocenica Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 99, 100, pl. 15, figs. 3, 4.

Typical specimens of this species occur at the Chipola facies localities nos. 9, 13; and at the Oak Grove facies locality no. 16.

Genus ANNULOCIBICIDES Cushman and Ponton, 1932

Annulocibicides projectus Cushman and Ponton

Plate 8, figs. 7, 8

Annulocibicides projectus Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 103, pl. 16, figs. 1a, b.

Typical specimens of this species occur at the Chipola facies localities nos. 9 and 12.

Subfamily PLANULININAE

Genus PLANULINA d'Orbigny, 1826

Planulina depressa (d'Orbigny)

Plate 27, figs. 1, 2, 3

Truncatulina depressa d'Orbigny, 1839, Voyage Amerique Meridionale, vol. 5, Pt. 5, Foraminifères, p. 39, pl. 6, figs. 4-6.

Planulina depressa Cushman, 1930, Florida Geol. Survey Bull. 4, p. 60, pl. 12, fig. 2.

———— Galloway and Heminway, 1941, New York Acad. Sci., vol. 3, Pt. 4, p. 398, pl. 25, fig. 3.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 32; and the *Cancellaria* facies localities nos. 49, 50, and 53.

TABLE 9

DISTRIBUTION OF ANOMALINIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Cibicides floridanus	—				—	—	—
Cibicides lobatulus	—						
Cibicides refulgens	—						
Rectocibicides miocenicus							—
Hanzawaia concentrica	—				—	—	—
Cibicidella variabilis	—						
Dyocibicides biserialis	—				—	—	—
Cycloloculina miocenica	—	—					
Annulocibicides projectus	—						
Planulina depressa					—		—

Family AMPHISTEGINIDAE

Genus AMPHISTEGINA d'Orbigny, 1826

Amphistegina chipolensis Cushman and Ponton

Amphistegina chipolensis Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 96, pl. 15, fig. 1.

——— Ellisor, 1940, Bull. Am. Assoc. Petroleum Geologists, vol. 24, no. 3, pl. 4, fig. 7; pl. 6, fig. 2.

——— Cushman and Todd, 1945, Cushman Lab. Foram. Res. Special Publ. 15, p. 61, pl. 10, fig. 6.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 5, 6, 7, 8, 9, 13 and 14.

Amphistegina floridana Cushman and Ponton

Plate 12, figs. 1, 2, 3, 4, 5, 6

Amphistegina floridana Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 96, pl. 14, figs. 6, 7.

——— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, p. 263, pl. 19, figs. 4-9.

Typical specimens of this species occur at the Chipola facies localities nos. 4, 8; and the Oak Grove facies locality no. 16.

Amphistegina lessonii d'Orbigny

Plate 19, figs. 9, 10, 11

Amphistegina lessonii d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 304, No. 3, pl. 17, figs. 1-4 (*A. quoii* in description of plate).

Amphistegina vulgaris d'Orbigny, 1826, ibid., p. 304, No. 4.

Amphistegina gibbosa d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 120, pl. 8, figs. 1-3.
Amphistegina vulgaris Parker, Jones and Brady, 1857, Ann. and Mag. Nat. Hist., ser. 3, vol. 16, p. 25, pl. 3, fig. 91.
Amphistegina hauerina d'Orbigny, 1846, Foram. Foss. Vienne, p. 107, pl. 12, figs. 3-5.
Amphistegina mammillata d'Orbigny, 1846, ibid., p. 208, pl. 12, figs. 6-8.
Amphistegina lessonii, Parker, Jones and Brady, 1865, Ann. and Mag. Nat. Hist., ser. 3, vol. 16, p. 34, pl. 3, fig. 92.
———— Brady, 1884, *Challenger* Rept., vol. 9, p. 740, pl. 111, figs. 1-7.
———— Cushman, 1914, U. S. Nat. Mus. Bull. 71, Pt. 4, p. 35, pl. 19, fig. 2.
———— Cushman, 1931, idem., Bull. 104, Pt. 8, p. 79, pl. 16, figs. 1-3.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 95, pl. 14, figs. 5a-c.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 32, pl. 11, fig. 6.
———— Cushman and Todd, 1945, Cushman Lab. Foram. Res., Special Publ. 15, p. 60, pl. 10, fig. 2.
———— Renz, 1948, Geol. Soc. America Mem. 32, p. 113, pl. 9, fig. 4.
———— Bermudez, 1949, Cushman Lab. Foram. Res., Special Publ. 25, pp. 263, 264, pl. 19, figs. 1-3.
———— Marks, 1951, Contr. Cushman Foundation Foram. Res., vol. 2, Pt. 2, p. 67.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 26, 27, 30; *Ecphora* facies localities nos. 37, 38, 40; and the *Cancellaria* facies localities nos. 48, 50, 52, 53, 54, 55, 57 and 58.

TABLE 10

DISTRIBUTION OF AMPHISTEGINIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Amphistegina chipolensis	——						
Amphistegina floridana	——	——					
Amphistegina lessonii					——	——	——

Family NONIONIDAE
Subfamily NONIONINAE
Genus NONION Montfort, 1808
Nonion advenum (Cushman)

Nonionina advena Cushman, 1922, U. S. Geol. Survey Prof. Paper 129-F, p. 139, pl. 32, fig. 8.
———— Cushman, 1923, idem., Prof. Paper 133, p. 50.

——— Cushman and Applin, 1926, Am. Assoc. Petroleum Geologists Bull., vol. 10, p. 181, pl. 10, figs. 16, 17.
Nonion advena (Cushman) Howe, 1928, Jour. Paleontology, vol. 2, p. 175 (list).
Nonion advenus Cole and Gillespie, 1930, Bull. Am. Paleontology, vol. 15, no. 57b, p. 10, pl. 2, fig. 15.
Nonion advenum Cushman, 1935, U. S. Geol. Survey Prof. Paper 181, p. 30, pl. 11, figs. 1-4.
——— Cushman, 1939, idem., Prof. Paper 191, p. 9, pl. 20, figs. 3, 4.
——— Berquist, 1942, Mississippi Geol. Survey Bull. 49, p. 59, pl. 6, fig. 20.
——— Cushman and McGlamery, 1942, U. S. Geol. Survey Prof. Paper 197-B, p. 69, pl. 5, fig. 8.
——— Applin and Jordan, 1945, Jour. Paleontology, vol. 19, pp. 129, 130 (lists).
——— Cushman and Ellisor, 1945, idem., vol. 19, p. 560, pl. 75, fig. 1.
——— Cushman, 1945, Contr. Cushman Lab. Foram. Res., vol. 21, p. 5, pl. 1, fig. 15.
——— Cushman and Herrick, 1945, idem., vol. 21, p. 61, pl. 10, fig. 9.
——— Cushman and Todd, 1945, idem., vol. 21, p. 91, pl. 15, fig. 1.
——— Cushman and Todd, 1946, idem, vol. 22, p. 88.
——— Todd, 1952, U. S. Geol. Survey Prof. Paper 241, p. 21, pl. 3, fig. 20.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 4, 5, 6, 7, 8, 13.

Nonion grateloupi (d'Orbigny)

Nonionina grateloupi d'Orbigny, 1826, Annales Sci. Nat., vol. 7, p. 294, no. 19.
——— d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminiféres, p. 46, pl. 6, figs. 6, 7.
Nonionina punctulata d'Orbigny, 1839, Voyage dans l'Amérique méridionale, vol. 5, p. 28, pl. 5, figs. 21, 22.
Nonionina grateloupi Fornasini, 1904, Accad. Sci. Ist. Bologna Mem., ser. 6, vol. 1, p. 12, pl. 3, fig. 5.
——— Cushman, 1921, U. S. Nat. Mus. Proc., vol. 59, p. 61, pl. 14, figs. 9-11.
——— Cushman, 1922, Carnegie Inst. Washington Publ. 311, p. 55, pl. 9, figs. 7, 8.
Nonion grateloupi Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 10, pl. 3, figs. 9-11.
——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 36, pl. 6, figs. 1-3.
——— Cushman and Valentine, 1930, Stanford Univ., Dept. Geology Contr., vol. 1, p. 20, pl. 5, figs. 9a, b.
——— Cushman and Parker, 1931, U. S. Nat. Mus. Proc., vol. 80, Art. 3, p. 10, pl. 2, figs. 6a, b.
——— Cole, 1931, Florida Geol. Survey Bull. 6, p. 32, pl. 7, figs. 7, 8.
——— Heron-Allen and Earland, 1932, *Discovery* Repts., vol. 4, p. 437, pl. 16, figs. 9, 10.
——— Cushman, 1933, U. S. Nat. Mus. Bull. 161, Pt. 2, p. 43, pl. 10, figs. 8a-c.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 20, pl. 7, figs. 1a, b.
——— Cushman, 1939, idem., Prof. Paper 191, pp. 21, 22, pl. 6, figs. 1-7.

Typical specimens of this species occur at the Chipola facies localities nos. 4, 5, 6, 7, 8, 9; the *Arca* facies localities nos. 24, 25, 27, 30, 31, 32; the *Ecphora* facies localities nos. 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 48, 49, 50, 52, 53, 54, 55, 57 and 58.

Nonion pizarrense Berry

Nonionina depressula Cushman, 1918 (not Walker and Jacob), U. S. Nat. Mus. Bull. 103, p. 72, pl. 25, figs. 5a, b.
Nonionina boueana Cushman, 1918 (not d'Orbigny), U. S. Geol. Survey Bull. 676, p. 68, pl. 25, fig. 3.
Nonion pizarrense Berry, 1928, Jour. Paleontology, vol. 1, p. 269, text figs. I (1-3).
———— Cushman and Kellett, 1929, U. S. Nat. Mus. Proc., vol. 75, Art. 25, p. 4, pl. 1, figs. 10a, b; pl. 2, figs. 1a, b.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 37, pl. 6, figs. 7, 8.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 69.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 20, pl. 7, figs. 2a, b.
———— Cushman and Kleinpell, 1934, Contr. Cushman Lab. Foram. Res., vol. 10, p. 4, pl. 1, figs. 9a, b.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 4, 5, 6, 7, 8, 9, 10; and the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30 and 32.

Genus ASTRONONION Cushman and Edwards, 1937

Astrononion glabrellum (Cushman)

Plate 26, figs. 4, 5

Nonion glabrellum Cushman, 1930, Florida Geol. Survey Bull. 4, p. 38, pl. 6, figs. 6a, b.
———— Cole, 1931, idem., Bull. 6, p. 31.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 69.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 20, pl. 7, figs. 3a, b.
———— Cushman, 1939, idem., Prof. Paper 191, p. 14, pl. 3, fig. 14.

Typical specimens of this species occur at the *Ecphora* facies localities nos. 38, 39, 40; and the *Cancellaria* facies localities nos. 48, 49 and 55.

Genus NONIONELLA Cushman, 1926

Nonionella auris (d'Orbigny)

Valvulina auris d'Orbigny, 1839, Voyage dan l' Amérique méridionale, vol. 5, Foraminiféres, p. 47, pl. 2, figs. 15-17.
Nonionina auris Cushman, 1925, Contr. Cushman Lab. Foram. Res., vol. 1, Pt. 2, p. 44, pl. 7, figs. 3a-c.
Nonionella auris Cushman and Kellett, 1929, U. S. Nat. Mus. Proc., vol. 75, Art. 25, p. 5, pl. 1, figs. 9a-c; pl. 2, figs. 2, 3.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 38, pl. 7, figs. 1a-c.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 69.
———— Heron-Allen and Earland, 1932, *Discovery* Repts., vol. 4, p. 438, pl. 16, figs. 17-19.
———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 21, pl. 7, figs. 6a, b.

———— Cushman, 1933, Cushman Lab. Foram. Res., Special Publ. 4, pl. 19, figs. 2a-c.
———— Cushman, 1933, U. S. Nat. Mus. Bull. 161, Pt. 2, p. 45, pl. 10, fig. 10 (not 11); pl. 11, figs. 1a-c.
———— Cushman, 1936, Geol. Soc. America Bull. vol. 47, pl. 5, figs. 1a-c.
———— Cushman, 1939, U. S. Geol. Survey Prof. Paper 191, p. 33, pl. 9, fig. 4.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 8, 9; the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; the *Ecphora* facies locality no. 39; and the *Cancellaria* facies localities nos. 50, 54 and 55.

Nonionella cf. *N. turgida* (Williamson)

Rotalina turgida Williamson, 1858, On the Recent Foraminifera of Great Britain, p. 50, pl. 4, figs. 95-97.
Nonionina asterizans var. *turgida* Parker and Jones, 1862, Introduction to the study of Foraminifera, appendix, p. 311.
Nonionina turgida H. B. Brady, 1864, Linnean Soc. London, Trans., vol. 24, p. 474.
———— H. B. Brady, 1884, *Challenger* Rept., Zoology, vol. 9, p. 731, pl. 109, figs. 17-19.
———— Balkwill and Wright, 1885, Royal Irish Acad. Trans., vol. 28, Sci., p. 352.
———— Terquem and Terquem, 1886, Soc. Zool. France Bull., vol. 11, p. 331, pl. 11, figs. 7, 8.
———— Egger, 1893, K. bayer. Akad. Wiss. Abh. Cl. 2, vol. 18, p. 425, pl. 19, figs. 45, 46.
———— Goës, 1894, K. svenska vetensk. akad. Handl., vol. 25, no. 9, p. 105, pl. 17, fig. 832.
Nonionella turgida Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 15, pl. 6, figs. 1-4.
———— Howe and Wallace, 1930, Louisiana Geol. Survey Bull. 2, p. 53, pl. 9, figs. 2a-c.
———— Cushman, 1939, U. S. Geol. Survey Prof. Paper 191, pp. 32, 33, pl. 9, figs. 2, 3.

Typical specimens of this species occur at the *Arca* facies localities 25 and 26.

Subfamily ELPHIDIINAE

Genus ELPHIDIUM Montfort, 1808

Elphidium advenum (Cushman)

Polystomella subnodosa H. B. Brady, 1884, (not von Münster), *Challenger* Rept., Zoology, vol. 9, p. 734, pl. 110, figs. 1a, b.
Polystomella advena Cushman, 1922, Carnegie Instit. Washington, Publ. 311, p. 56, pl. 9, figs. 11, 12.
———— Cushman, 1924, idem., Publ. 342, p. 48.
Elphidium advenum Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 25, pl. 10, figs. 1, 2.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 40, pl. 7, figs. 7a, b.
———— Cushman and Parker, 1931, U. S. Nat. Mus. Proc., vol. 80, Art. 3, p. 11.
———— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 70, pl. 11, figs. 1a, b.
———— Cushman, 1933, U. S. Nat. Mus. Bull. 161, p. 50, pl. 12, figs. 1-3.

——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 22, pl. 7, figs. 10a, b.
——— Cushman, 1939, idem., Prof. Paper 191, pp. 60, 61, pl. 16, figs. 31-35.

Typical specimens of this species occur at Chipola facies localities nos. 3, 4, 5, 6, 7, 8, 9, 10, 13; *Arca* facies localities nos. 24, 25, 26, 27, 28, 32; *Ecphora* facies localities nos. 37, 38, 40; and *Cancellaria* facies localities nos. 48, 49, 52, 53, 54 and 57.

Elphidium chipolense (Cushman)

Plate 6, figs. 13, 14

Polystomella chipolensis Cushman, 1921, U. S. Geol. Survey Prof. Paper 128-B, p. 72, pl. 11, fig. 23.
Elphidium chipolensis Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 70, pl. 11, figs. 3a, b.
Elphidium chipolense Cushman, 1939, U. S. Geol. Survey Prof. Paper 191, pp. 46, 47, pl. 12, fig. 12.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 4, 6, 7, 8, 9, 10 and 13.

Elphidium fimbriatulum (Cushman)

Polystomella fimbriatula Cushman, 1918, U. S. Geol. Survey Bull. 676, p. 20, pl. 8, fig. 5.
Elphidium fimbriatulum Cole, 1932, Florida Geol. Survey Bull. 6, p. 33, pl. 4, fig. 7.
——— Cushman and Ponton, 1932, idem., Bull. 9, p. 70, pl. 11, figs. 2a, b.
——— Cushman, 1939, U. S. Geol. Survey Prof. Paper. 191, p. 47, pl. 12, fig. 13.

Typical specimens of this species occur at the Chipola facies locality no. 2; *Arca* facies locality no. 24; *Ecphora* facies locality no. 36; and the *Cancellaria* facies localities nos. 48 and 56.

Elphidium incertum (Williamson)

Plate 19, figs. 1, 2

Polystomella umbilicatula var. *incerta* Williamson, 1858, Rec. Foram. of Gt. Britain, p. 44, pl. 3, figs. 82, 82a.
Polystomella striato-punctata var. *incerta* Kiaer, 1900, Rept. Norwegian Fish. Mar. Invest., vol. 1, no. 7, p. 51.
Polystomella decipiens Heron-Allen and Earland, 1916, (not Costa), Linnean Soc. London Trans., ser. 2, vol. 11, p. 282, pl. 43, figs. 20-22.
Elphidium incertum Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 18, pl. 7, figs. 4-9.
——— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 39, pl. 7, figs. 2a, b.
——— Cushman and Cole, 1930, Contr. Cushman Lab. Foram. Res., vol. 6, p. 96, pl. 13, figs. 6, 7.
——— Cole, 1931, Florida Geol. Survey Bull. 6, p. 35, pl. 4, fig. 8.
——— Dolgopolskaya and Pauli, 1931, Station Biologique Karadagh Travaux, vol. 4, p. 37, pl. 3, figs. 15a, b.
——— Macfadyen, 1932, Geol. Mag., vol. 69, pl. 35, figs. 16a, b.
——— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper, 175-A, p. 21, pl. 7, fig. 8.

———————— Shupack, 1934, Am. Mus. Novitates, No. 737, p. 12, figs. 10a, b.
Elphidium brooklynense Shupack, 1934, ibid., p. 10, figs. 7a, b.
Elphidium florentinae Shupack, 1934, ibid., p. 9, figs. 5a, b.
Elphidium incertum Cushman, 1939 U. S. Geol. Survey Prof. Paper 191, p. 57, pl. 15, figs. 21-24.

Typical specimens of this species occur at the *Cancellaria* facies localities nos. 52 and 57.

Elphidium sagrum (d'Orbigny)

Polystomella sagra d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 55, pl. 6, figs. 19, 20.
———————— Cushman, 1918, U. S. Nat. Mus. Bull. 103, p. 75, pl. 26, figs. 5a, b.
———————— Cushman, 1920, U. S. Geol. Survey Prof. Paper 128-B, p. 71, pl. 11, figs. 20, 21.
Polystomella lanieri Cushman, 1920, (not d'Orbigny), ibid, p. 72, pl. 11, fig. 22.
———————— Cushman, 1921, U. S. Nat. Mus. Proc., vol. 59, p. 61, pl. 14, figs. 12, 13.
Elphidium sagrum Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 24, pl. 9, figs. 5, 6.
———————— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 40, pl. 7, figs. 6a, b.
———————— Cole, 1931, idem., Bull. 6, p. 37, pl. 4, fig. 5.
———————— Cushman and Ponton, 1932, idem., Bull. 9, p. 70.
———————— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 22, pl. 7, figs. 9a, b.
———————— Cushman, 1939, idem., Prof. Paper 191, p. 55, pl. 15, figs. 1-3.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 4, 6; and the *Arca* facies localities nos. 24, 25, 26, 27, 30, and 32.

Elphidium sp.
(Bull. 4, pl. 7, fig. 5)

Elphidium sp.? Cushman, 1930, Florida Geol. Survey Bull. 4, p. 41, pl. 7, figs. 5a, b.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 9; *Arca* facies localities nos. 25, 28, 30 and 32.

Genus ELPHIDIONONION Hofker, 1951
Elphidiononion poeyanum (d'Orbigny)

Polystomella poeyana d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 55, pl. 6, figs. 25-26.
———————— Cushman, 1922, Carnegie Inst. Washington Publ. 311, p. 55, pl. 9, figs. 9, 10.
Elphidium poeyanum Cushman, 1930, U. S. Nat. Mus. Bull. 104, Pt. 7, p. 25, pl. 10, figs. 4, 5.
———————— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 39, pl. 7, figs. 3, 4.
———————— Cushman and Parker, 1931, U. S. Nat. Mus. Proc., vol. 80, Art. 3, p. 10.
———————— Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 69.

———— Cushman and Cahill, 1933, U. S. Geol. Survey Prof. Paper 175-A, p. 21, pl. 7, figs. 7a, b.
———— Cushman, 1939, idem., Prof. Paper 191, pp. 54, 55, pl. 14, figs. 25, 26.

Typical specimens of this species occur at the Chipola facies localities nos. 5, 8, 9, 10; the *Arca* facies localities nos. 24, 27, 28, 31, 32; the *Ecphora* localities 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 49, 50, 53, 54, 55, and 58.

TABLE 11

DISTRIBUTION OF NONIONIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Nonion advenum	—						
Nonion grateloupi	—				—	—	—
Nonion pizarrense	—				—		
Astrononion glabrellum						—	—
Nonionella auris	—				—	—	—
Nonionella cf. N. turgida					—		
Elphidium advenum	—				—	—	—
Elphidium chipolense	—						
Elphidium fimbriatulum	—				—	—	—
Elphidium incertum							—
Elphidium sagrum	—				—		
Elphidium sp.	—				—		
Elphidiononion poeyanum	—				—	—	—

Family GLOBIGERINIDAE

Subfamily GLOBIGERININAE

Genus GLOBIGERINA d'Orbigny, 1826

Globigerina sp.

Small, broken tests of a *Globigerina* occur at the Chipola facies localities nos. 1, 3, 4, 5, 6, 7, 8, 9; *Arca* facies localities nos. 37, 38, 39, 40; *Cancellaria* facies localities nos. 48, 49, 50, 52, 57 and 58.

Genus ORBULINA d'Orbigny, 1839

Orbulina universa d'Orbigny

Orbulina universa d'Orbigny, 1839, in De la Sagra, Historia fisca, politica y natural de la isla de Cuba, Foraminifères, p. 3, pl. 1.
———— Cushman, 1924, U. S. Nat. Mus. Bull. 104, p. 28, pl. 5, figs. 2-9.
———— Cushman, 1930, Florida Geol. Survey Bull. 4, p. 59.
———— Cushman and Ponton, 1932, idem., Bull. 9, p. 99.
———— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 282, pl. 22, fig. 3.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; the *Ecphora* facies localities nos. 38, 39, 40; and the *Cancellaria* facies localities nos. 49 and 52.

Family GLOBOROTALIIDAE
Genus GLOBOROTALIA Cushman, 1927
Globorotalia menardii (d'Orbigny)
Plate 25, figs. 4, 5, 6

Rotalia menardii d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 273, mod. 10.
Rotalia boueana d'Orbigny, 1846, Foram. foss. Vienne, p. 152, pl. 7, figs. 25-27.
Pulvinulina menardii H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 690, pl. 103, figs. 1, 2.
Pulvinulina tumida H. B. Brady, ibid., p. 692, pl. 103, figs. 4-6.
———— Cushman, 1915, U. S. Nat. Mus. Bull. 71, Pt. 5, p. 56, pl. 22, fig. 3.
Globorotalia menardii Cushman, 1930, Florida Geol. Survey Bull. 4, p. 60, pl. 12, figs. 1a-c.
———— Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, pp. 91-94, pl. 17, fig. 1.
———— Cole and Ponton, 1932, Florida Geol. Survey Bull 5, p. 45, pl. 11, figs. 4, 5.
———— Nuttall, 1932, Jour. Paleontology, vol. 6, p. 29, pl. 4, fig. 16.
———— Schmidt, 1934, Eclogae geol. Helv., vol. 27, p. 45.
———— Hadley, 1934, Bull. Am. Paleontology, vol. 20, No. 70-A, p. 25, pl. 3, figs. 12, 13.
———— Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 336, pl. 42, figs. 34, 35.
———— Bermudez, 1949, Cushman Lab. Foram. Res. Special Publ. 25, p. 286, pl. 22, figs. 24-26.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 32; the *Ecphora* facies localities nos. 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 48, 49, 50, 52 and 58.

Family PLANORBULINIDAE
Subfamily PLANORBULININAE
Genus ACERVULINA Schultze, 1854
Acervulina chipolensis Cushman and Ponton
Plate 9, figs. 1, 2

Acervulina chipolensis Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, pp. 104-105, pl. 16, figs. 7, 8.

Typical specimens of this species occur at the Chipola facies locality no. 3.

Acervulina inhaerens Schultze
Plate 19, figs. 14, 15

Acervulina inhaerens Schultze, 1854, Organ Polythal., p. 68, pl. 6, fig. 12.
Gypsina inhaerens H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 718, pl. 102, figs. 1-6.
Acervulina inhaerens Cushman, 1930, Florida Geol. Survey Bull. 4, p. 63.

__________ Cushman, 1931, U. S. Nat. Mus. Bull. 104, Pt. 8, p. 134, pl. 25, figs. 2a-c.
__________ Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 104, pl. 16, figs. 5, 6.

Typical specimens of this species occur at the *Cancellaria* facies localities nos. 48, 54, 56.

Subfamily GYPSININAE

Genus GYPSINA Carter, 1877

Gypsina vesicularis (Parker and Jones)

Plate 9, figs. 3, 4

Orbitolina vesicularis Parker and Jones, 1860, Ann. and Mag. Nat. History, ser. 3, vol. 6, p. 31, No. 5.
Gypsina vesicularis Carter, 1877, idem., ser. 4, vol. 20, p. 173.
__________ H. B. Brady, 1884, *Challenger* Rept., vol. 9, p. 718, pl. 101, figs. 9-12.
__________ Heron-Allen and Earland, 1913, Proc. Roy. Irish Acad. vol. 31, Pt. 64, p. 140, pl. 13, fig. 11.
__________ Cushman and Ponton, 1932, Florida Geol. Survey Bull. 9, p. 105, pl. 16, figs. 9a, b.

Typical specimens of this species occur at the Chipola facies localities nos. 3, 10.

PLATES 1 - 30

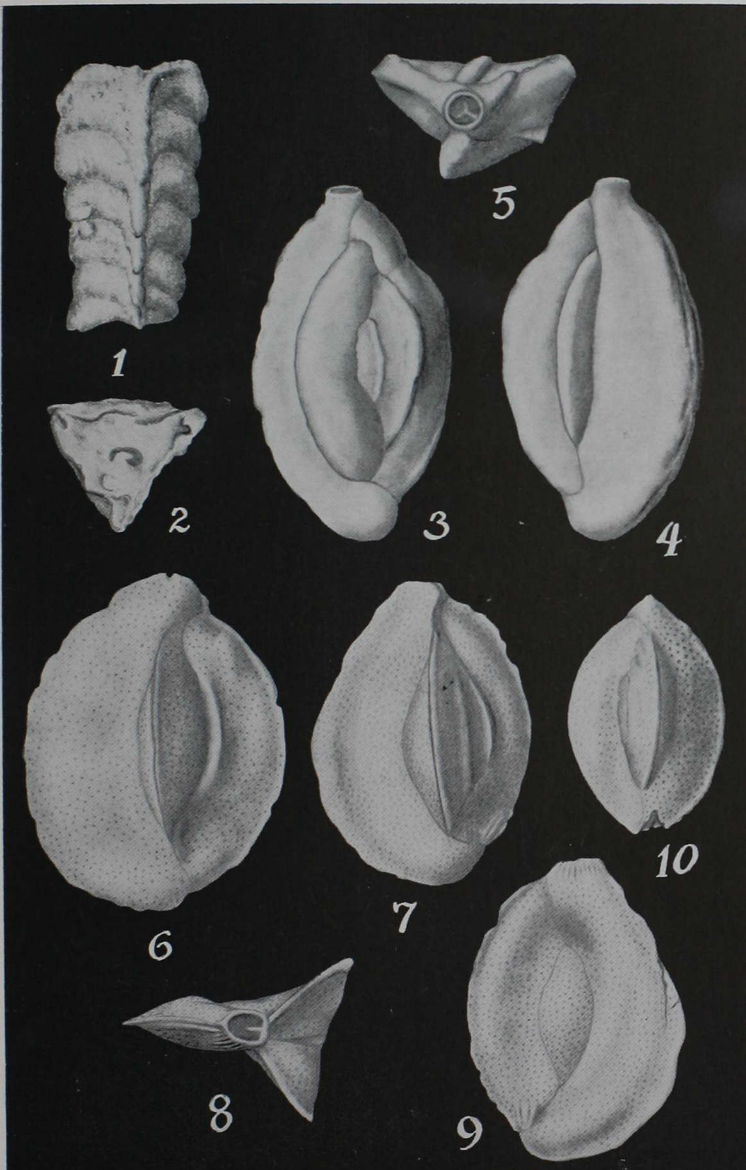
Explanation to Plate 1

Figures

1, 2—*Clavulina tricarinata* d'Orbigny. X53. Broken specimen. 1, side view; 2, end view of the same specimen.

3, 4, 5—*Quinqueloculina candeiana* d'Orbigny. X53. 3, side view; 4, apertural view of the same specimen; 5, opposite side of figure 3.

6, 7, 8, 9, 10—*Quinqueloculina chipolensis* Cushman and Ponton. X53. 6, holotype, side view; 7, apertural view of the same specimen; 8, side view; 9, opposite side of the same specimen; 10, side view.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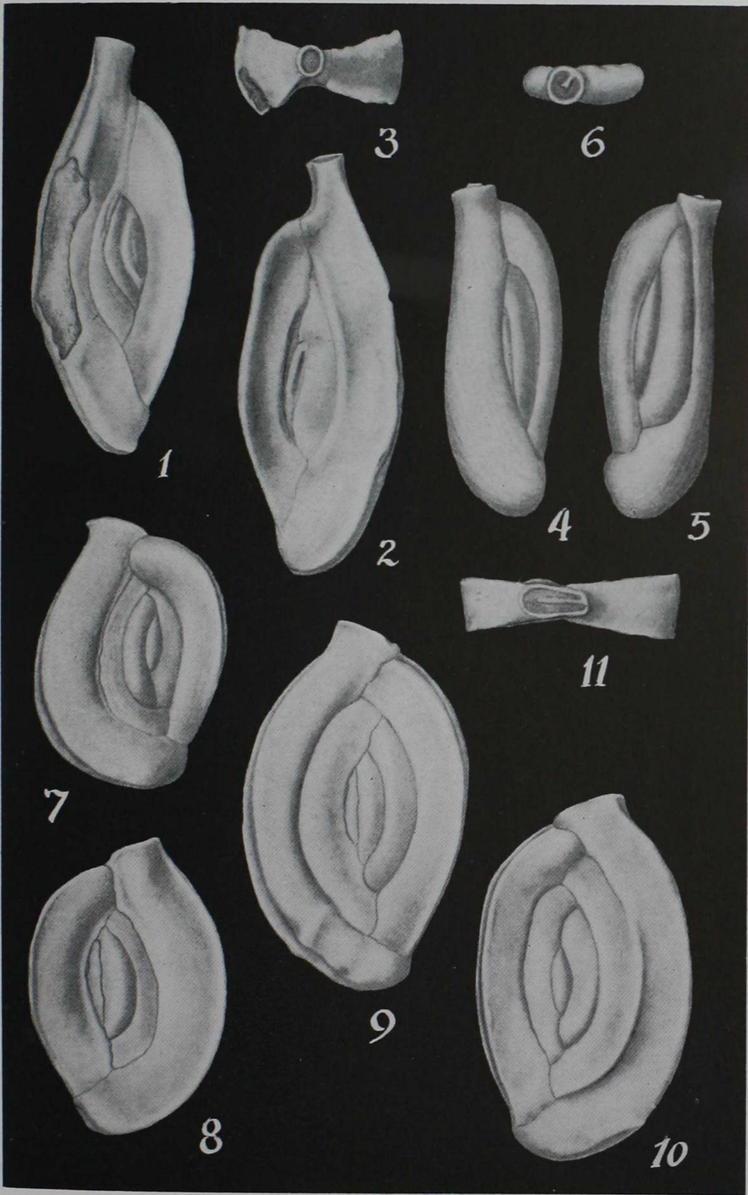
Explanation to Plate 2

Figures

1, 2, 3—*Massilina inaequalis* Cushman. X53. 1, side view; 2, opposite side of the same specimen; 3, apertural view of the same specimen.

4, 5, 6—*Massilina bosciana* (d'Orbigny). X53. 4, side view; 5, opposite side of the same specimen; 6, apertural view of the same specimen.

7, 8, 9, 10, 11—*Massilina quadrans* Cushman and Ponton. X53. 7, side view; 8, side view; 9, holotype, side view; 10, opposite side of the same specimen; 11, apertural view of the same specimen.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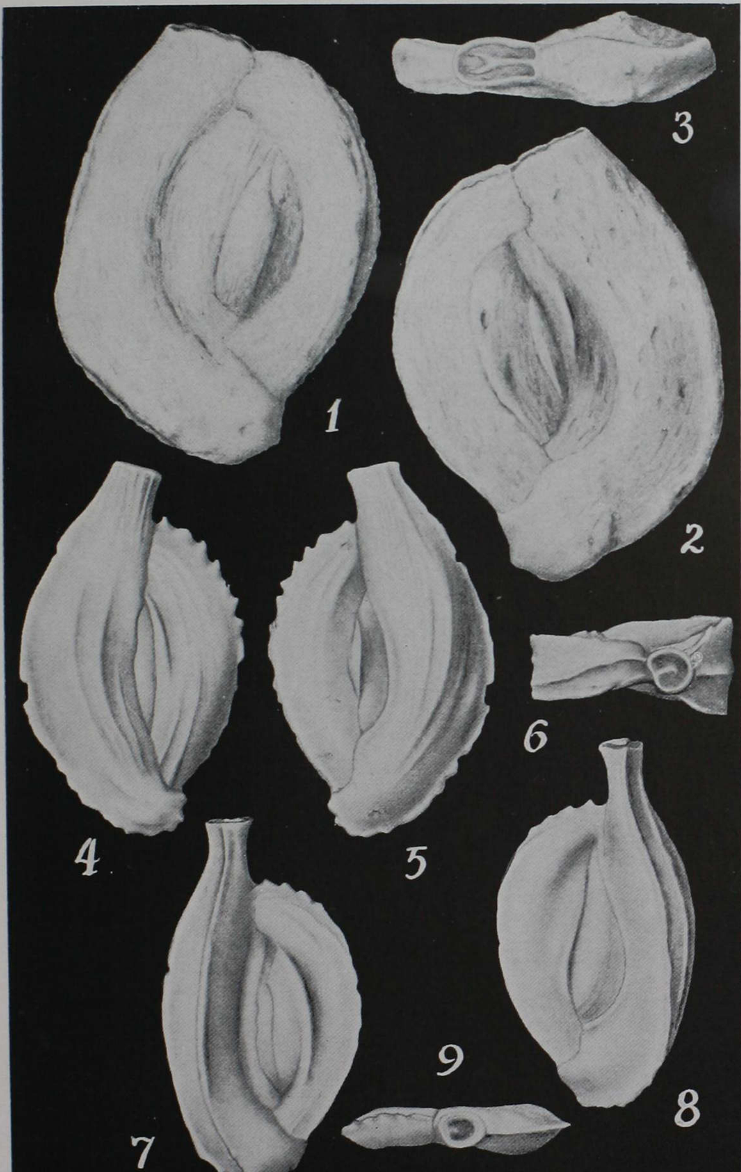
Explanation to Plate 3

Figures

1, 2, 3—*Massilina incisa* Cushman and Ponton. X43. 1, holotype, side view; 2, opposite side of the same specimen; 3, apertural view of the same specimen.

4, 5, 6—*Massilina spinata* Cushman and Ponton. X53. 4, holotype, side view; 5, opposite side of the same specimen; 6, apertural view of the same specimen.

7, 8, 9—*Massilina spinata chipolensis* Cushman and Ponton. X53. 7, holotype, side view; 8, opposite side of the same specimen; 9, apertural view of the same specimen.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Explanation to Plate 4

Figures

1, 2, 3—*Massilina spinata glabrata* Cushman and Ponton. X53. 1, holotype, side view; 2, opposite side of the same specimen; 3, apertural view of the same specimen.

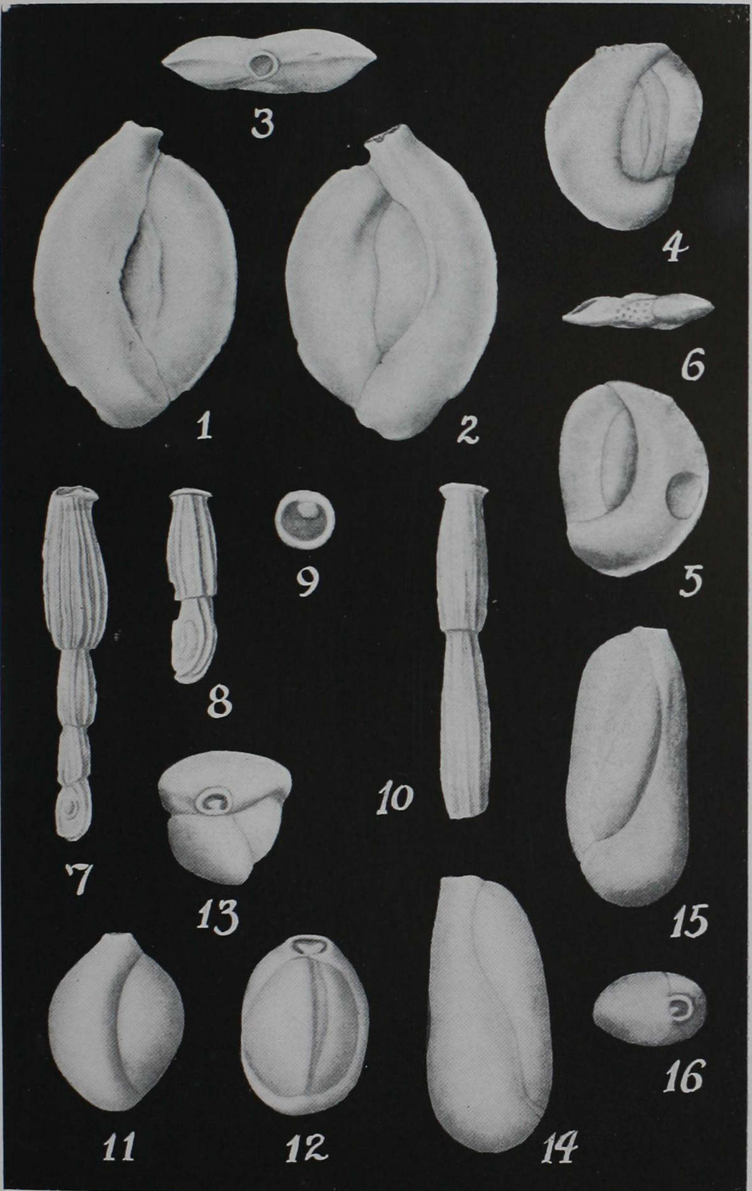
4, 5, 6—*Hauerina miocenica* Cushman. X100. 4, side view; 5, opposite side of the same specimen; 6, apertural view of the same specimen.

7, 8—*Articulina miocenica* Cushman and Ponton. X53. 7, holotype, adult, side view; 8, young stage.

9, 10—*Articulina mayori* Cushman. X100. 9, side view; 10, apertural view of the same specimen.

11, 12, 13—*Triloculina trigonula* (Lamarck). X80. 11, side view; 12, front view of the same specimen; 13, apertural view of the same specimen.

14, 15, 16—*Triloculina oblonga* (Montagu). X80. 14, side view; 15, opposite side of the same specimen; 16, apertural view.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Explanation to Plate 5

Figures

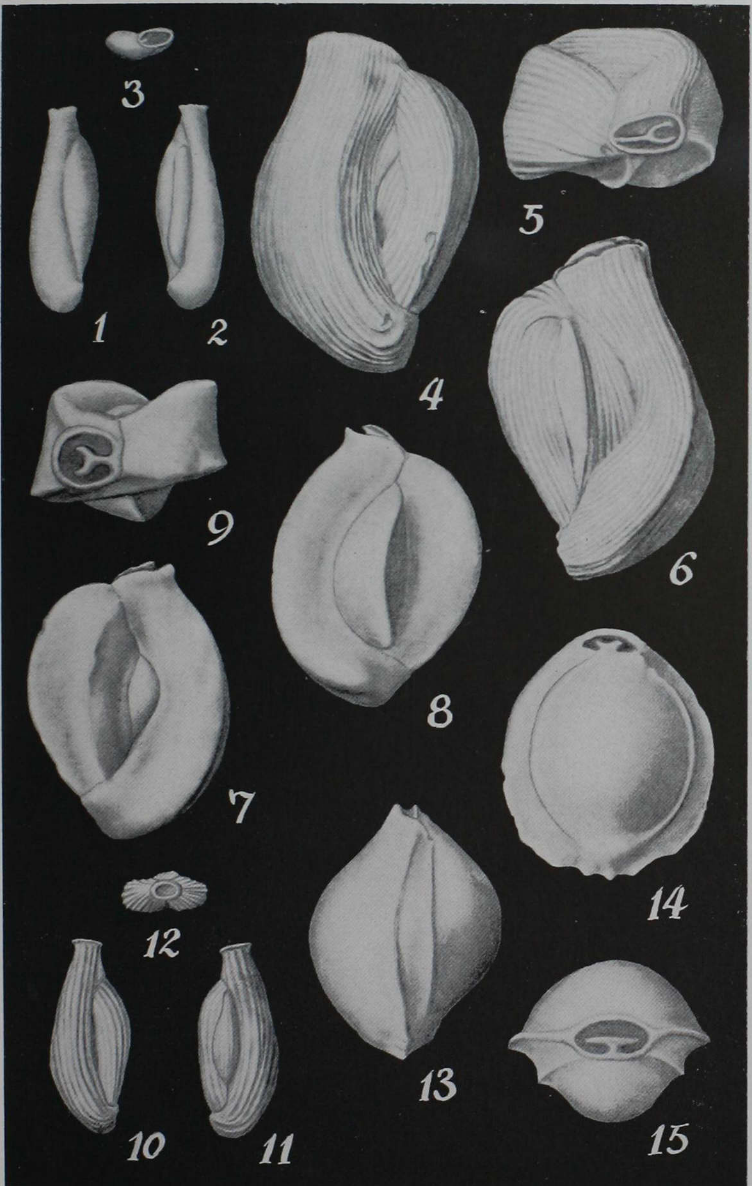
1, 2, 3—*Triloculina gracilis* d'Orbigny. X100. Fig. 1, side view; 2, apertural view of the same specimen; 3, opposite side of figure 1.

4, 5, 6—*Triloculina quadrilateralis longicostata* Cushman and Ponton. X53. 4, side view; 5, apertural view of the same specimen; 6, opposite side of figure 4.

7, 8, 9—*Triloculina quadrilateralis* d'Orbigny. X53. 7, apertural view; 8, side view of the same specimen; 9, opposite side of the same specimen.

10, 11, 12—*Triloculina brongniartii* d'Orbigny. X80. 10, side view; 11, apertural view of the same specimen; 12, opposite side of figure 10.

13, 14, 15—*Pyrgo denticulata* (H. B. Brady). X53. 13, side view; 14, front view of the same specimen; 15, apertural view of the same specimen.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Explanation to Plate 6

Figures

1, 2—*Articulina advena* (d'Orbigny). X80. 1, side view; 2, apertural view of the same specimen.

3, 4, 5—*Vertebralina multilocularis* (H. B. Brady, Parker and Jones). X80. 3, adult, side view; 4, apertural view of the same specimen; 5, opposite side of figure 3.

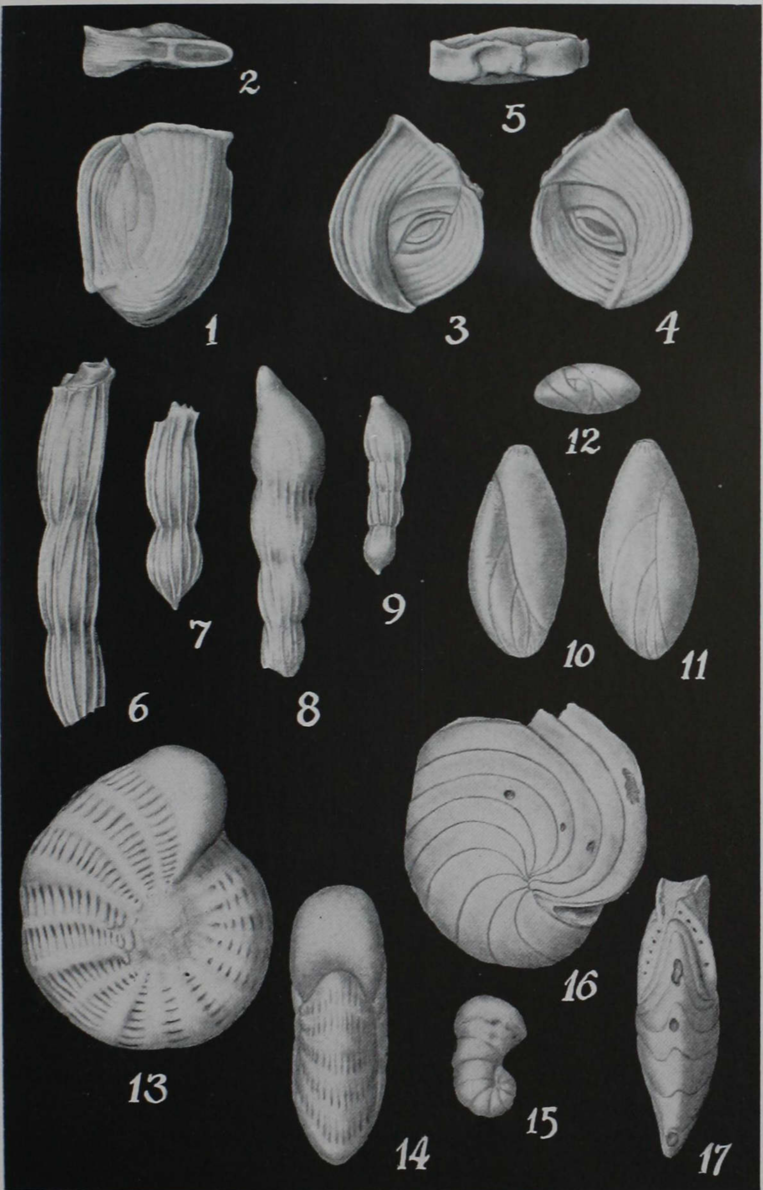
6, 7—*Dentalina sp. A.* (Cushman and Ponton, plante 9, figs. 1, 2). X53.

8, 9—*Dentalina sp. B.* (Cushman and Ponton, plate 9, figs. 3, 4). X80.

10, 11, 12—*Sigmomorphina undulosa* (Terquem). X100. 10, side view; 11, basal view of the same specimen; 12, opposite side of figure 10.

13, 14—*Elphidium chipolensis* (Cushman). X73. 13, side view; 14, peripheral view.

15, 16, 17—*Puteolina proteus* (d'Orbigny). X40. Specimens showing variations in form. 15, side view; 16, side view; 17, apertural view of the same specimen.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Explanation to Plate 7

Figures

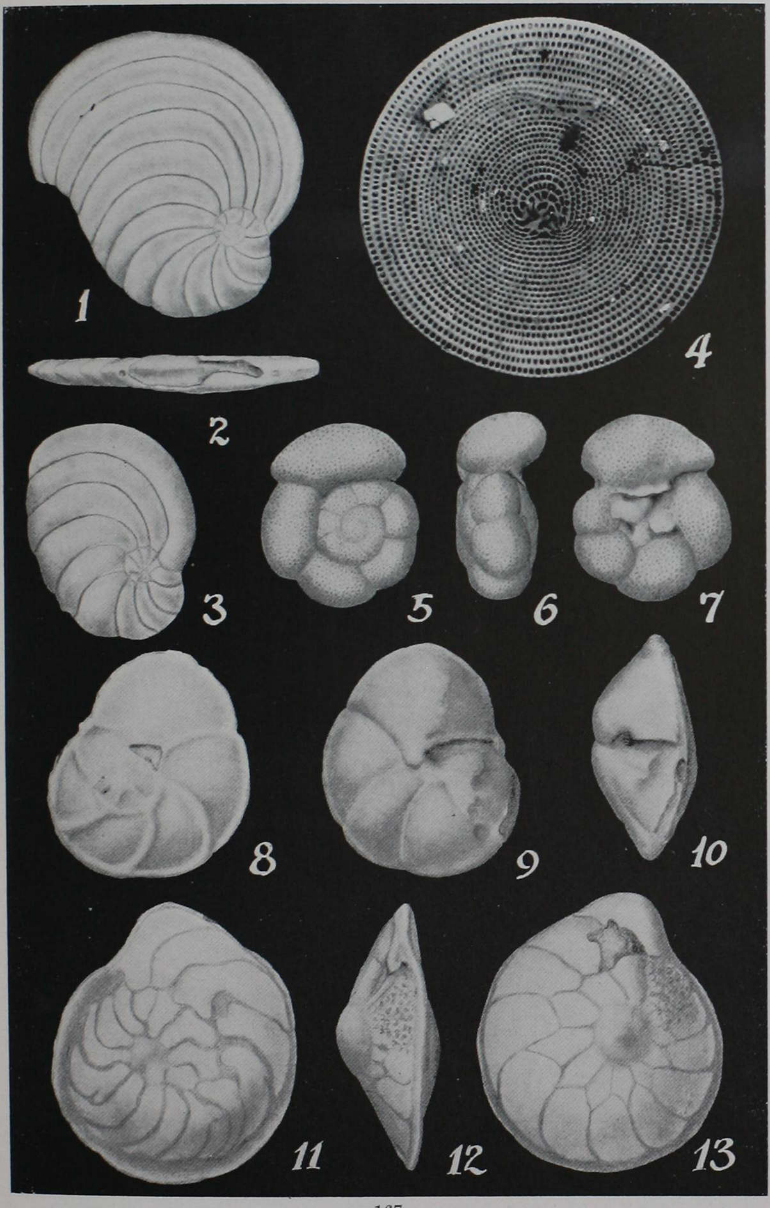
1, 2, 3—*Peneroplis bradyi* Cushman. X53. 1, side view; 2, peripheral view of the same specimen; 3, early stage.

4—*Sorites(?) sp.(?)* X20. Specimen from the exterior showing the arrangement of chambers in the megalospheric form. The specimen has been eroded so that the opening shows the chamberlets.

5, 6, 7—*Discorbis candeiana bullata* Cushman and Ponton. X73. 5, dorsal view; 6, peripheral view of the same specimen; 7, ventral view of the same specimen.

8, 9, 10—*Eponides repandus* (Fichtel and Moll). X53. 8, dorsal view; 9, peripheral view of the same specimen; 10, ventral view of the same specimen.

11, 12, 13—*Amphistegina chipolensis* Cushman and Ponton. X53. 11, ventral view; 12, peripheral view; 13, dorsal view.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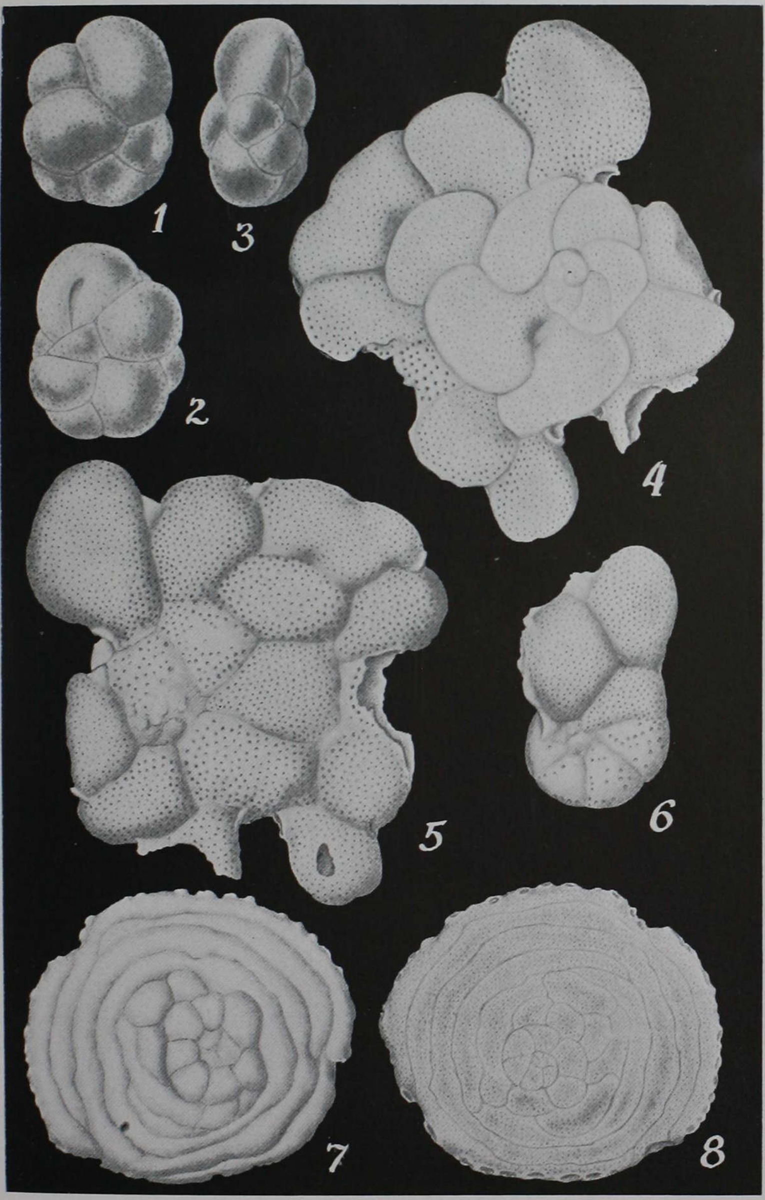
Explanation to Plate 8

Figures

1, 2, 3—*Cassidulina chipolensis* Cushman and Ponton. X200. 1, dorsal view; 2, peripheral view of the same specimen; 3, ventral view of the same specimen.

4, 5, 6—*Cibicidella variabilis* (d'Orbigny). X43. 4, adult form, dorsal view; 5, ventral view of the same specimen; 6, early stage.

7, 8—*Annulocibicides projectus* Cushman and Ponton. X53. 7, dorsal view; 8, ventral view of the same specimen.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Explanation to Plate 9

Figures

1, 2—*Acervulina chipolensis* Cushman and Ponton. X53. 1, holotype, ventral view; 2, dorsal view of the same specimen.

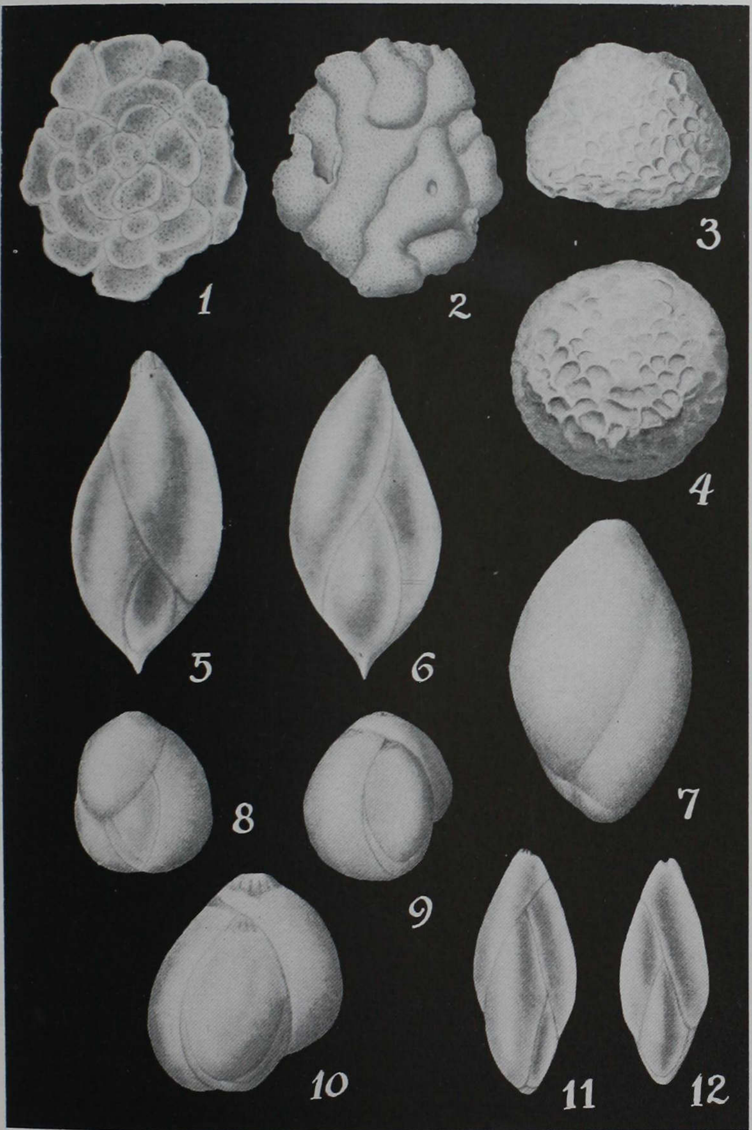
3, 4—*Gypsina vesicularis* Parker and Jones. X66. 3, side view; 4, same specimen as viewed above.

5, 6—*Guttulina caudata* d'Orbigny. X80. 5, side view; 6, opposite side of the same specimen.

7—*Globulina rotundata* (Bornemann). X86. Side view.

8, 9, 10—*Guttulina irregularis* (d'Orbigny). X53. 8, side view; 9, opposite side of the same specimen; 10, side view.

11, 12—*Guttulina lactea* (Walker and Jacob). X100. 11, side view; 12, opposite side of the same specimen.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Explanation to Plate 10

Figures

1, 2—*Textularia warreni* Cushman and Ellisor. X53. 1, front view; 2, apertural view of the same specimen.

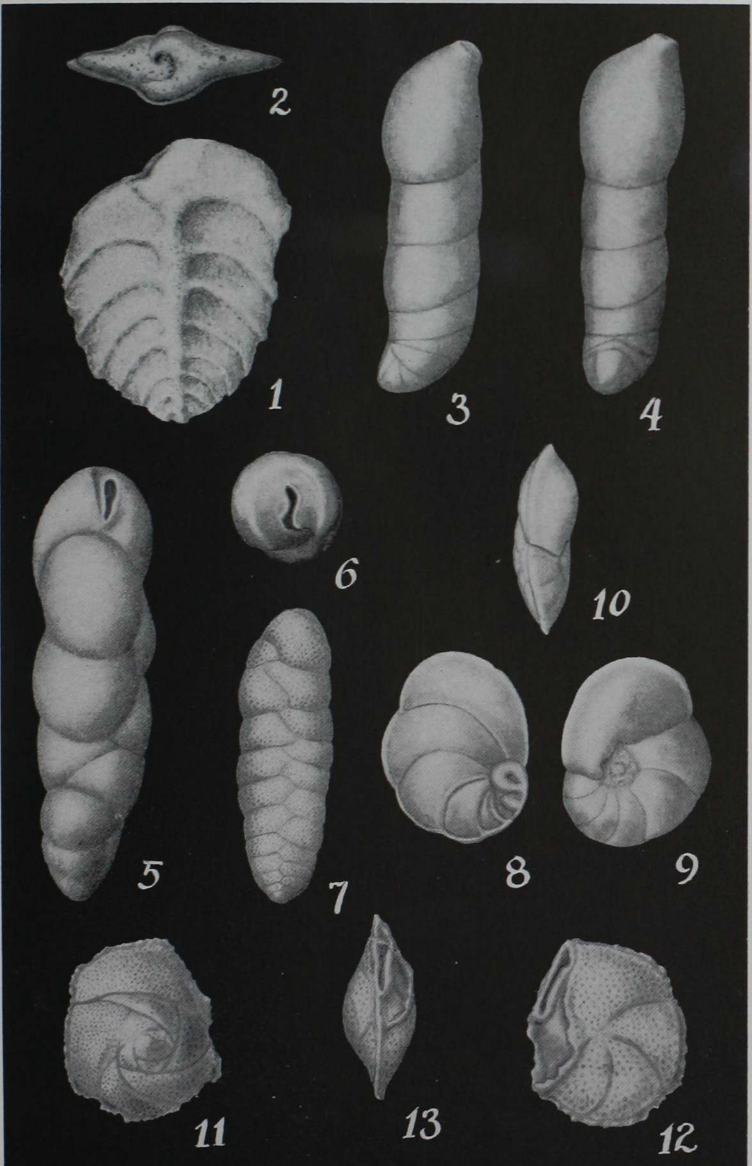
3, 4—*Marginulina glabra* d'Orbigny. X80. 3, side view; 4, front view of the same specimen.

5, 6—*Bulimina elongata* d'Orbigny. X113. 5, side view; 6, apertural view of the same specimen.

7—*Bolivina robusta* (H. B. Brady). X73. Front view.

8, 9, 10—*Lamarckina atlantica* Cushman. X66. 8, dorsal view; 9, ventral view of the same specimen; 10, apertural view of the same specimen.

11, 12, 13—*Siphonina jacksonensis limbosa* Cushman. X73. 11, dorsal view; 12, ventral view of the same specimen; 13, apertural view of the same specimen.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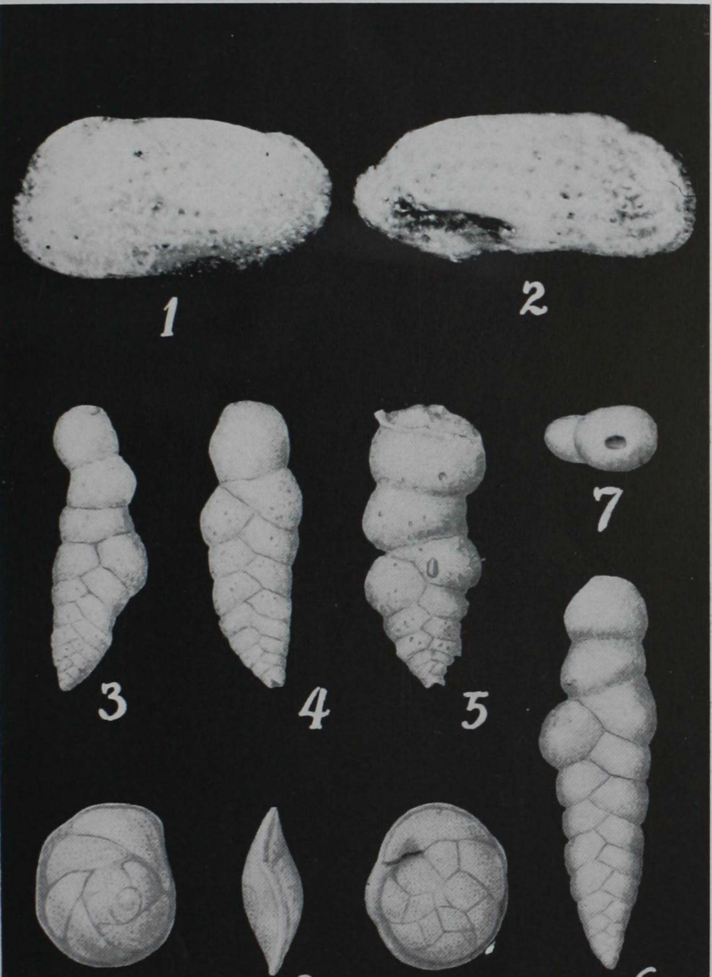
Explanation to Plate 11

Figures

1, 2—*Cytheretta gardneri* Smith. X45. 1, left valve; 2, right valve.

3, 4, 5, 6, 7—*Bigenerina floridana* Cushman and Ponton. X53. 3, 4, 5, front view; 6, front view; 7, apertural view of the same specimen. 6, 7, holotype.

8, 9, 10—*Asterigerina miocenica* Cushman and Ponton. X166. 8, dorsal view; 9, peripheral view of the same specimen; 10, ventral view of the same specimen.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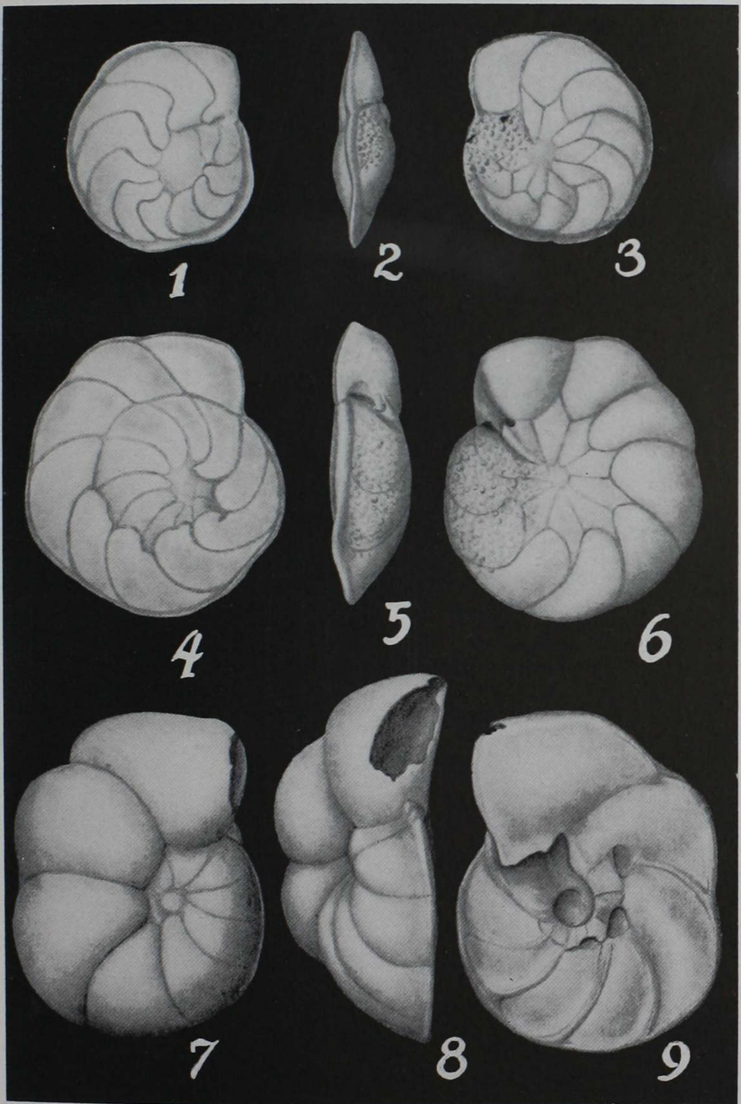
Explanation to Plate 12

Figures

1, 2, 3, 4, 5, 6—*Amphistegina floridana* Cushman and Ponton. X53. 1, dorsal view; 2, peripheral view of the same specimen; 3, ventral view of the same specimen; 4, dorsal view; 5, peripheral view of the same specimen; 6, ventral view of the same specimen. 1-3, paratype, 4-6, holotype.

7, 8, 9—*Hanzawaia concentrica* (Cushman). X60. 7, dorsal view; 8, peripheral view of the same specimen; 9, ventral view of the same specimen.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Explanation to Plate 13

Figures

1, 2—*Cycloculina miocenica* Cushman and Ponton. X133.

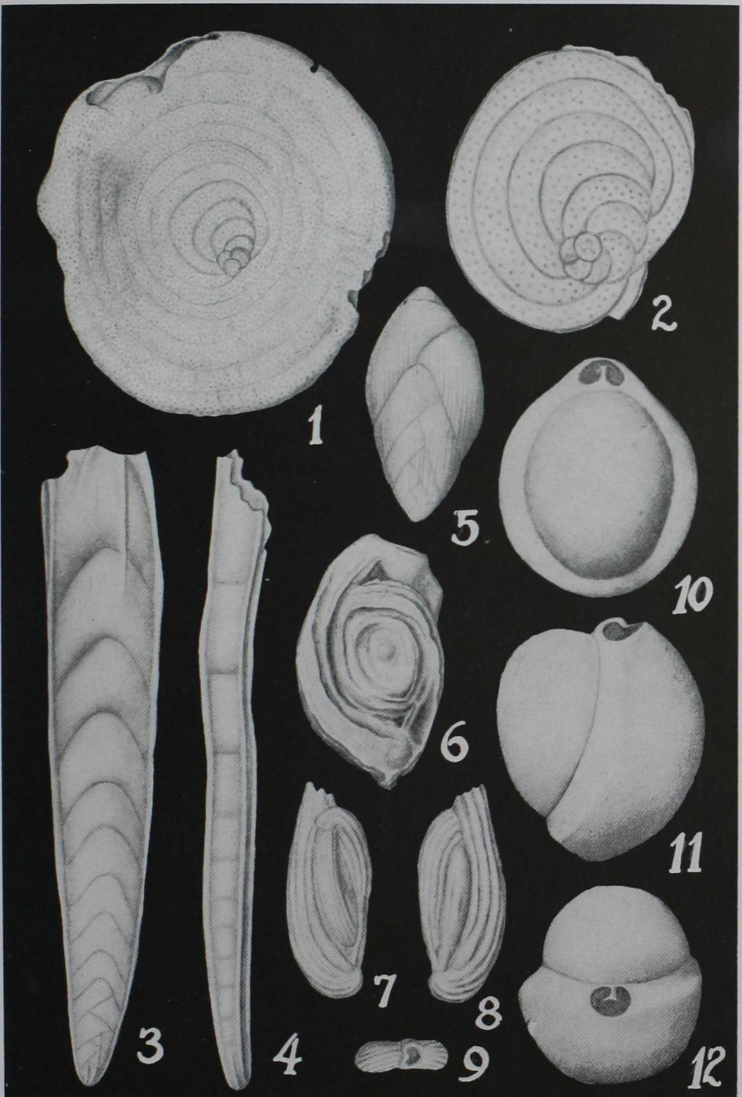
3, 4—*Plectofrondicularia mansfieldi* Cushman and Ponton X66. 3, front view; 4, side view of the same specimen.

5—*Polymorphina advena* Cushman. X100.

6—*Spiroloculina* sp. Cushman. X113.

7, 8, 9—*Quinqueloculina subpoeyana* Cushman. X100. 7, 8, opposite sides; 9, apertural view of the same specimen.

10, 11, 12—*Pyrgo subsphaerica* (d'Orbigny). X53. 10, front view; 11, side view of the same specimen; 12, apertural view of the same specimen.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Explanation to Plate 14

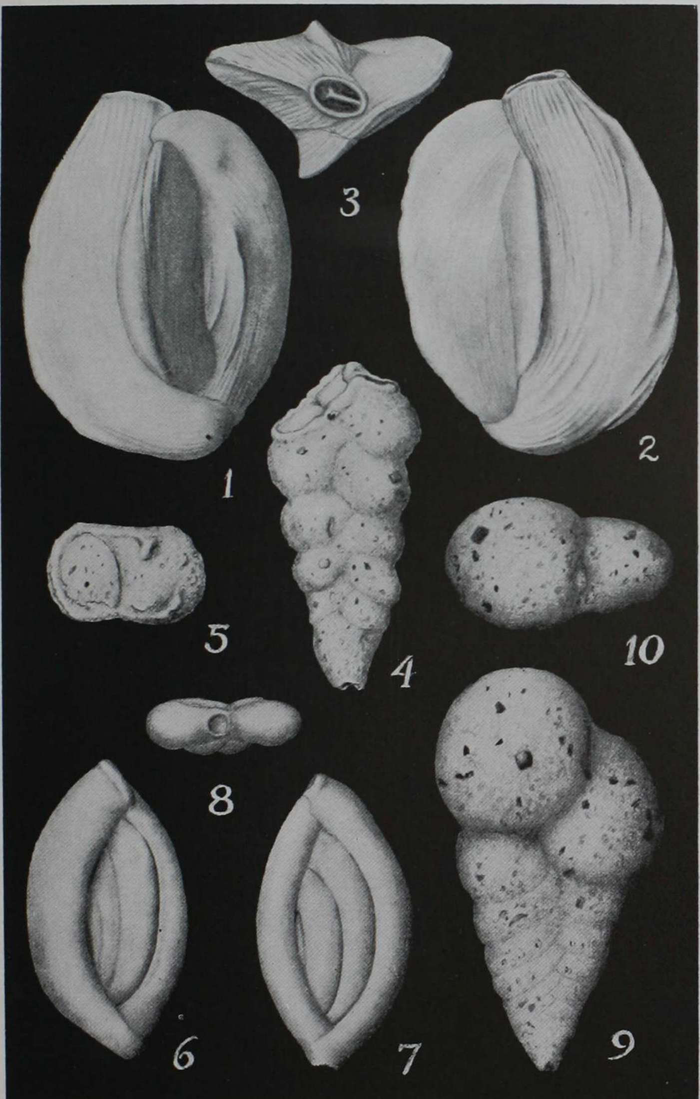
Figures

1, 2, 3—*Quinqueloculina crassa subcuneata* Cushman. X53. 1, 2, opposites sides; 3, apertural view of the same specimen.

4, 5—*Textularia sp.* Cushman and Ponton. X53. 4, front view; 5, apertural view of the same specimen.

6, 7, 8—*Sigmorlina tenuis* (Czjzek). X113. 6, 7, opposite sides; 8, apertural view of the same specimen.

9, 10—*Textularia agglutinans* d'Orbigny. X113. 9, front view; 10, apertural view of the same specimen.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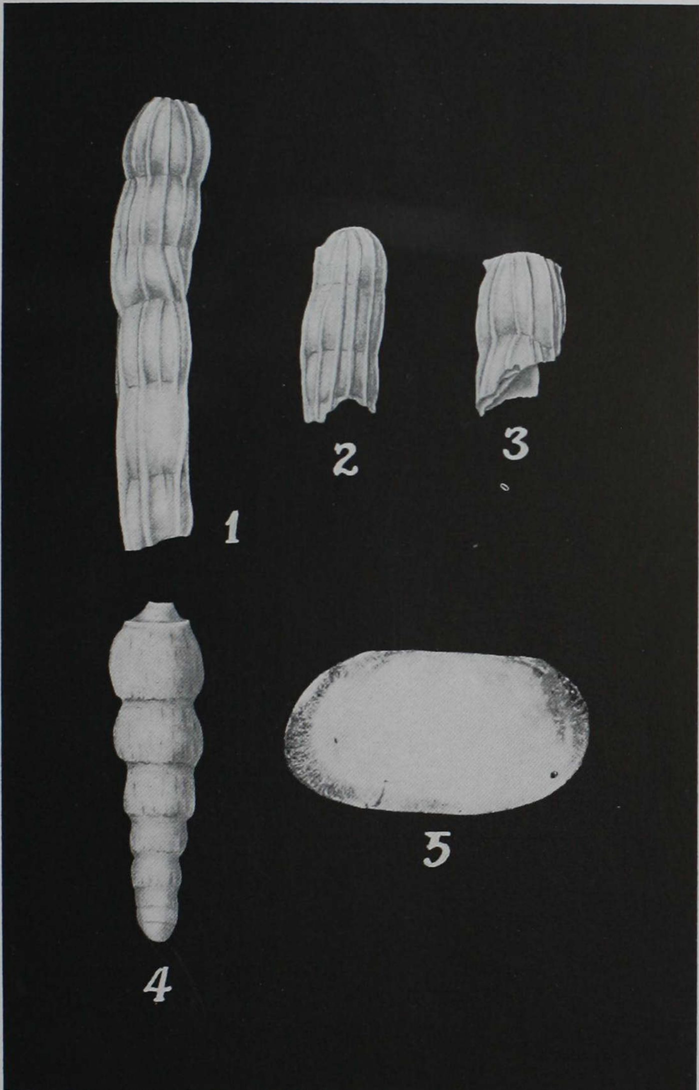
Explanation to Plate 15

Figures

1, 2, 3—*Amphimorphina sp.* Cushman and Ponton. X53. Fragmentary specimens.

4—*Nodogenerina advena* Cushman and Laiming. X73.

5—*Cytheretta spencerensis* Smith. X45.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Explanation to Plate 16

Figures

1, 2, 3—*Flintina floridana* Cushman and Ponton. X53. 1, side view; 2, holotype, side view; 3, apertural view of the same specimen.

4, 5—*Robulus floridanus* (Cushman). X53. 4, side view; 5, peripheral view of the same specimen.

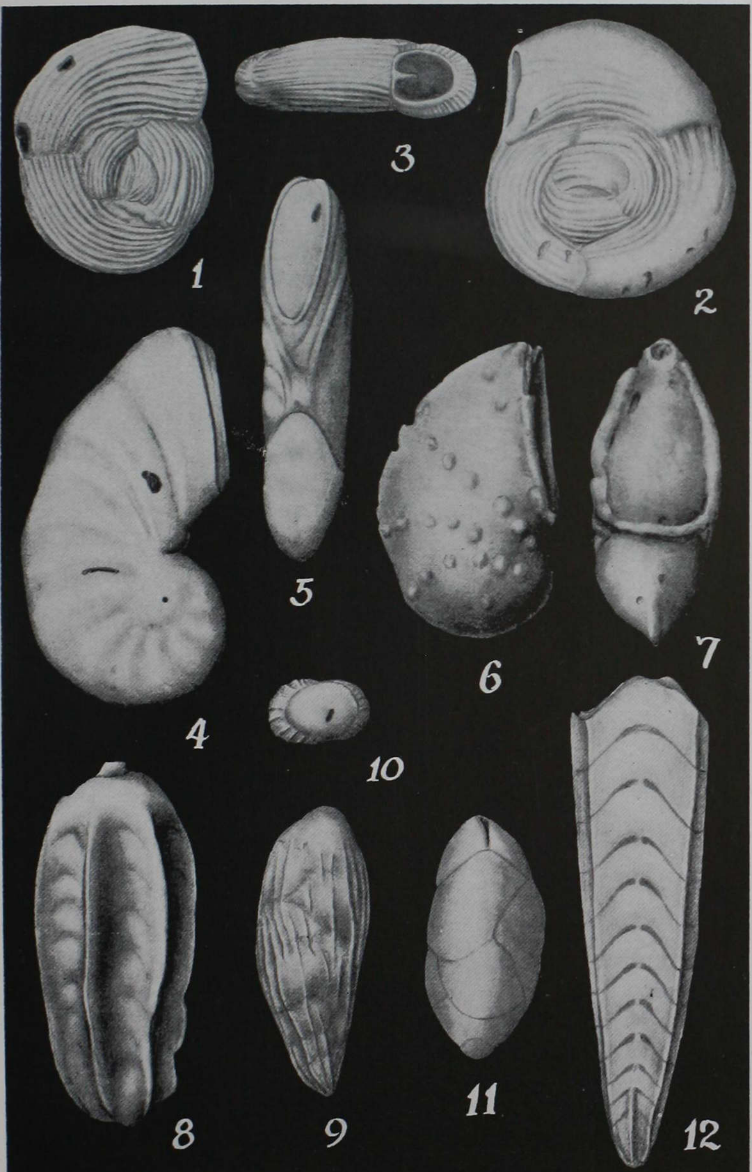
6, 7—*Robulus catenulatus* (Cushman). X86. 6, side view; 7, peripheral view of the same specimen.

8—*Siphogenerina lamellata* Cushman. X60.

9, 10—*Loxostomum gunteri* Cushman. X86. 9, side view; 10, apertural view of the same specimen.

11—*Bulimina ovata* d'Orbigny. X66.

12—*Plectofrondicularia floridana* Cushman. X73.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Explanation to Plate 17

Figures

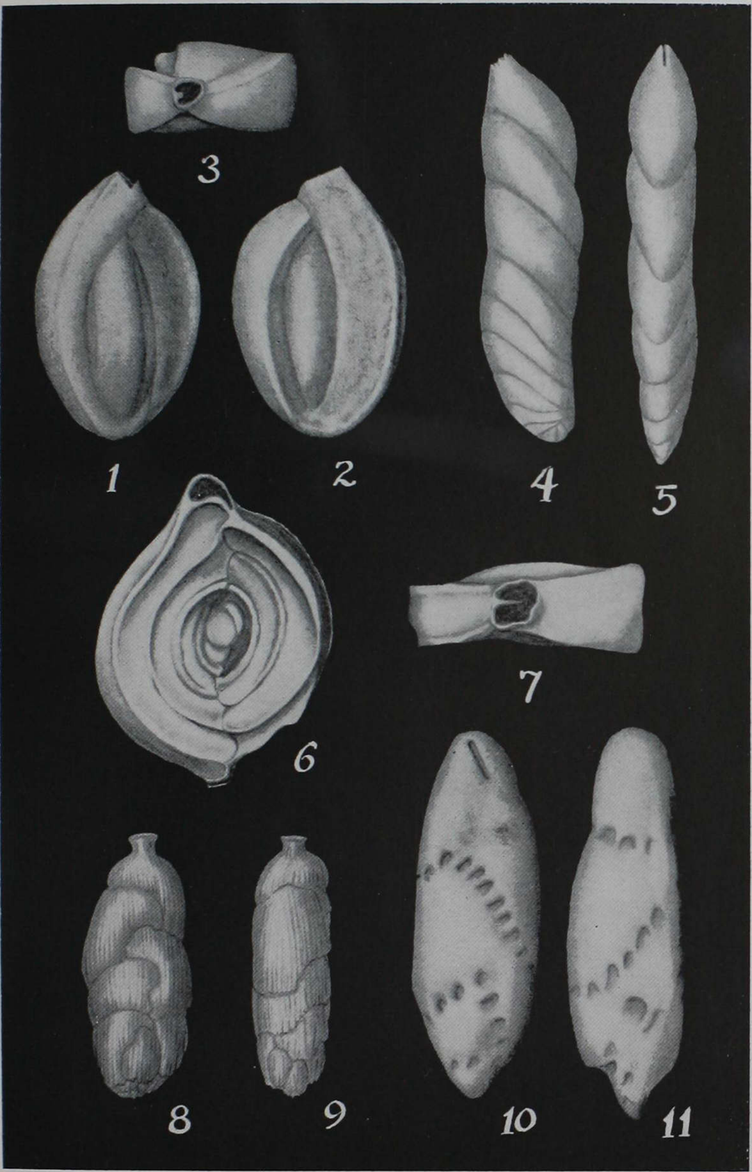
1, 2, 3—*Quinqueloculina contorta* d'Orbigny. X133. 1, 2, opposite sides; 3, apertural view of the same specimen.

4, 5—*Marginulina dubia* Neugeboren. X53. 4, side view; 5, front view of the same specimen.

6, 7—*Spiroloculina depressa* d'Orbigny. X60. 6, front view; 7, apertural view of the same specimen.

8, 9—*Uvigerina parkeri* Karrer. X73. 8, front view; 9, side view of the same specimen.

10, 11—*Virgulina (Virgulinella) gunteri curtata* Cushman and Ponton. X60.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Explanation to Plate 18

Figures

1, 2—*Textularia floridana* Cushman. X113. 1, front view; 2, apertural view of the same specimen.

3, 4, 5—*Textularia foliacea occidentalis* Cushman. X53. 3, front view; 4, front view; 5, apertural view of the same specimen.

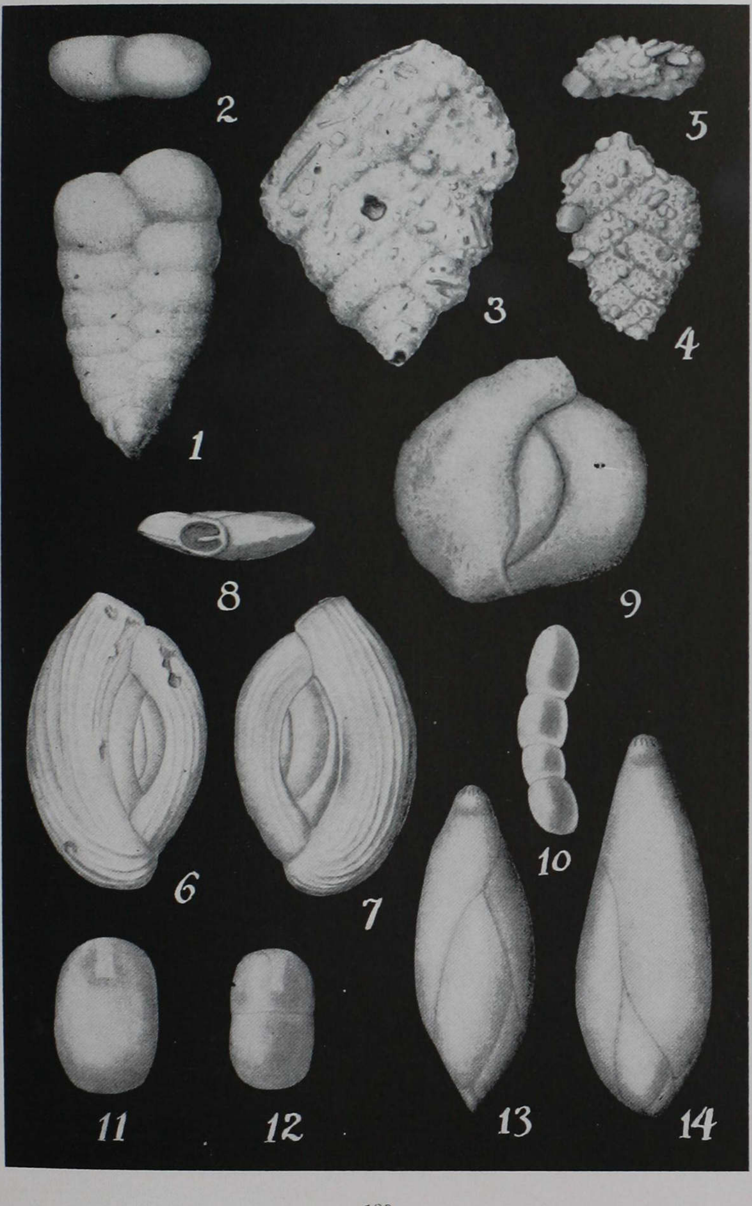
6, 7, 8—*Massilina gunteri* Cushman and Ponton. X53. 6, 7, opposite sides; 8, apertural view of the same specimen.

9—*Triloculina asperula* Cushman. X113.

10—*Nodosaria calomorpha* Reuss. X100.

11, 12—*Oolina quadrata* (Williamson). X133. 11, specimen with a single chamber; 12, specimen with tracings of a partition.

13, 14—*Pyrulina albatrossi* Cushman and Ozawa. X86.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Explanation to Plate 19

Figures

1, 2—*Elphidium incertum* (Williamson). X113. 1, side view; 2, peripheral view of the same specimen.

3, 4—*Pavonia miocenica* Cushman and Ponton. X73. 3, side view; 4, apertural view of the same specimen.

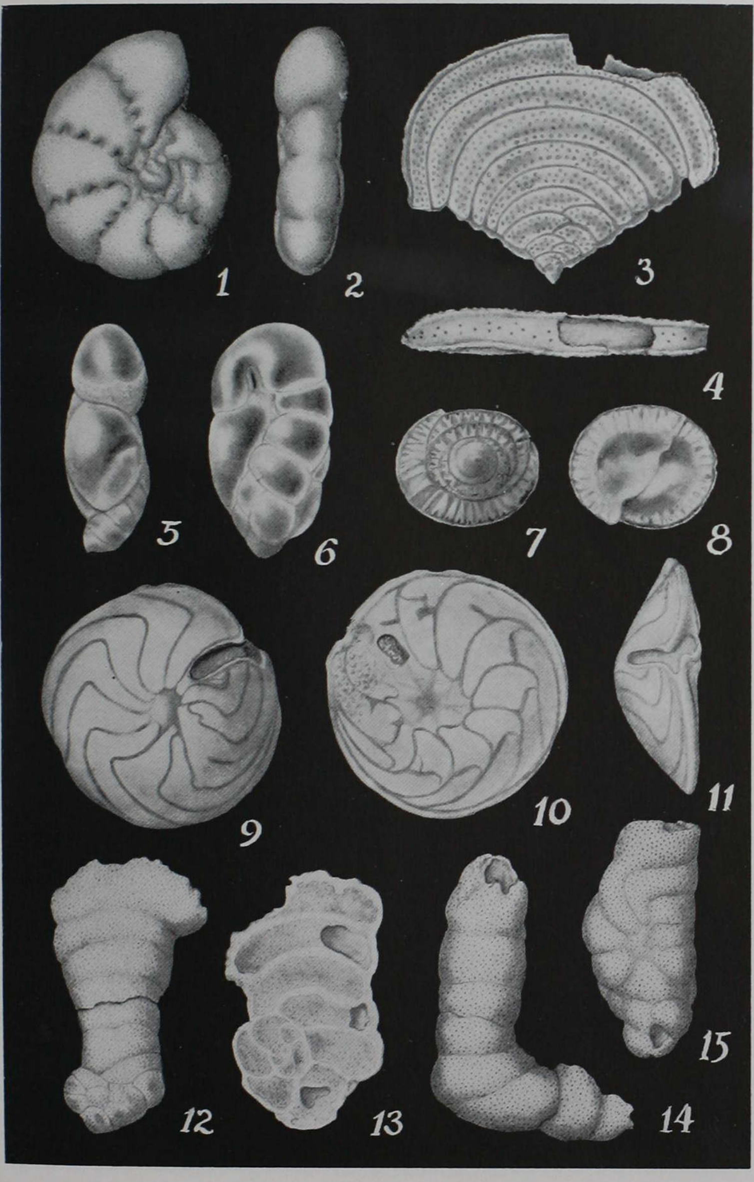
5, 6—*Robertina subteres* (Brady). X160. 5, side view; 6, front view of the same specimen.

7, 8—*Patellina corrugata* Williamson. X100. 7, dorsal view; 8, ventral view of the same specimen.

9, 10, 11—*Amphistegina lessonii* d'Orbigny. X53. 9, dorsal view; 10, ventral view of the same specimen; 11, peripheral view of the same specimen.

12, 13—*Rectocibicides miocenica* Cushman and Ponton. X43. 12, holotype, ventral interior view; 13, dorsal attached side.

14, 15—*Acervulina inhaerens* Schultze. X53. External views.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Explanation to Plate 20

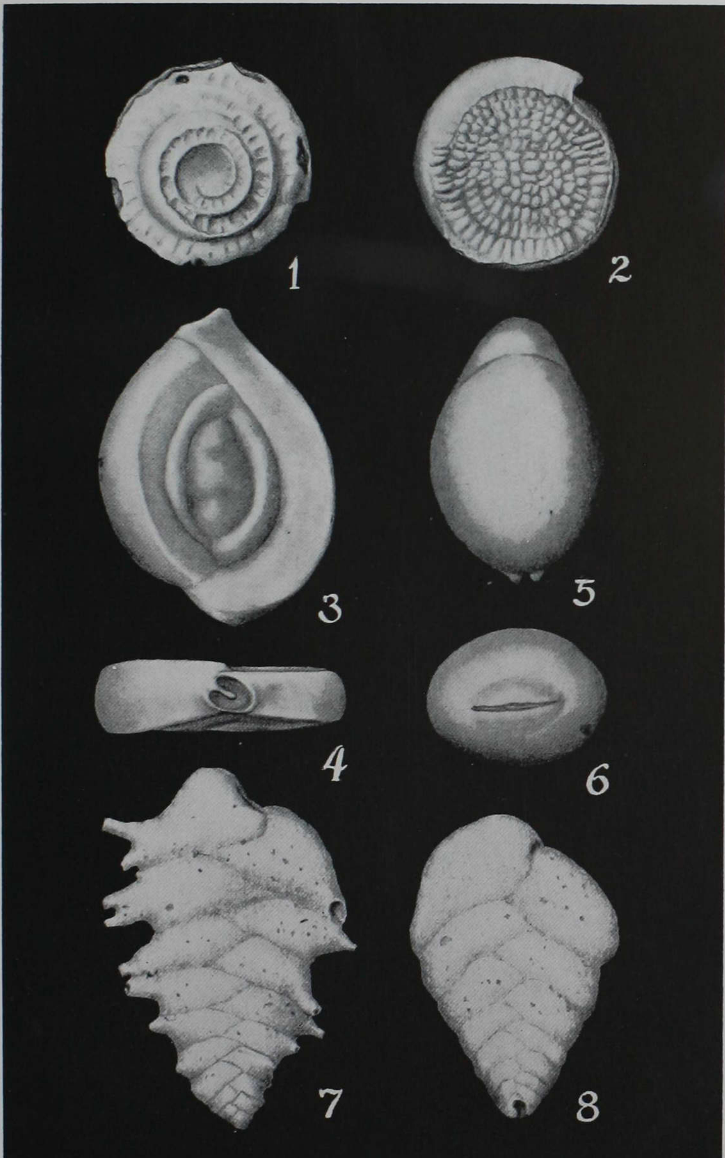
Figures

1, 2—*Planispirillina orbicularis* (Bagg). X113. 1, dorsal view; 2, ventral view of the same specimen.

3, 4—*Spiroloculina dentata* Cushman and Todd. X113. 3, front view; 4, apertural view of the same specimen.

5, 6—*Parafissurina bidens* (Cushman). X133. 5, side view; 6, apertural view of the same specimen.

7, 8—*Textularia mayori* Cushman. X53. 7, specimen with unusual spinosity; 8, specimen with usual outline.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Explanation to Plate 21

Figures

1, 2, 3—*Miliammina* cf. *M. fusca* (Brady). X113. 1, side view; 2, 3, opposite sides.

4, 5—*Oolina hexagona scalariformis* (Williamson). X113. 4, side view; 5, apertural view of the same specimen.

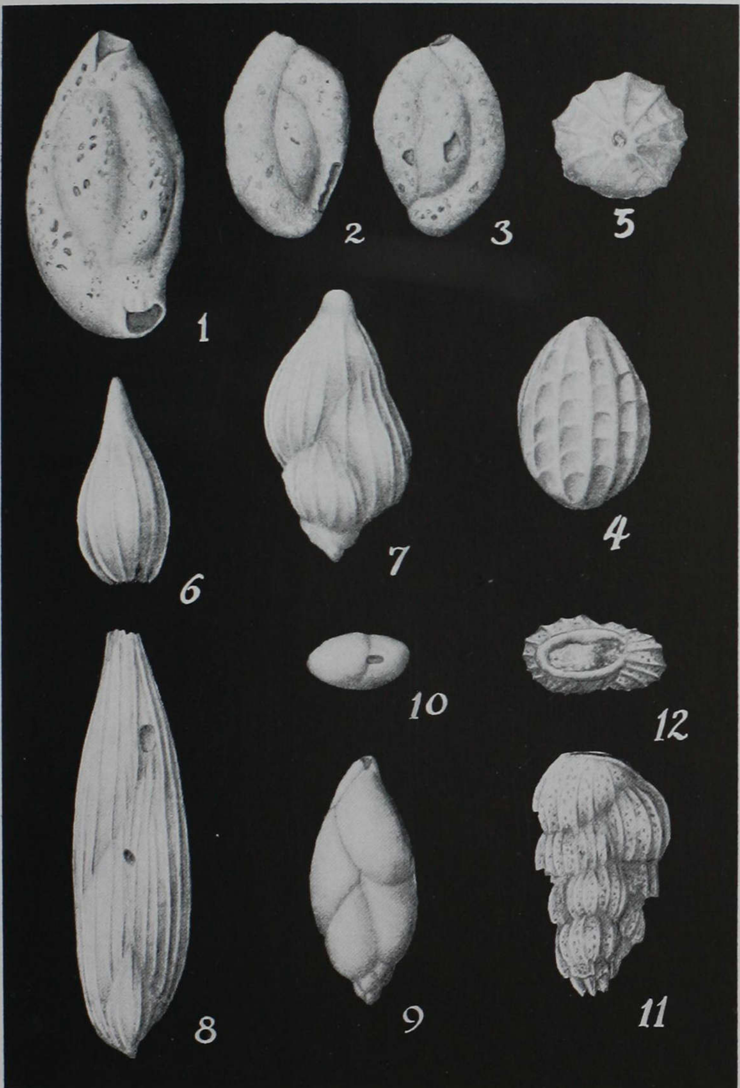
6—*Lagena costata amphora* Reuss. X113.

7—*Guttulina costatula* Galloway and Wissler. X86.

8—*Pseudopolymorphina rutila* (Cushman). X86.

9, 10—*Virgulina fusiformis* Cushman. X133. 9, side view; 10, apertural view of the same specimen.

11, 12—*Bolivina pulchella primitiva* Cushman. X113. 11, side view; 12, apertural view of the same specimen.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Explanation to Plate 22

Figures

1, 2—*Bulimina inflata* Seguenza. X73. 1, side view; 2, apertural view of the same specimen.

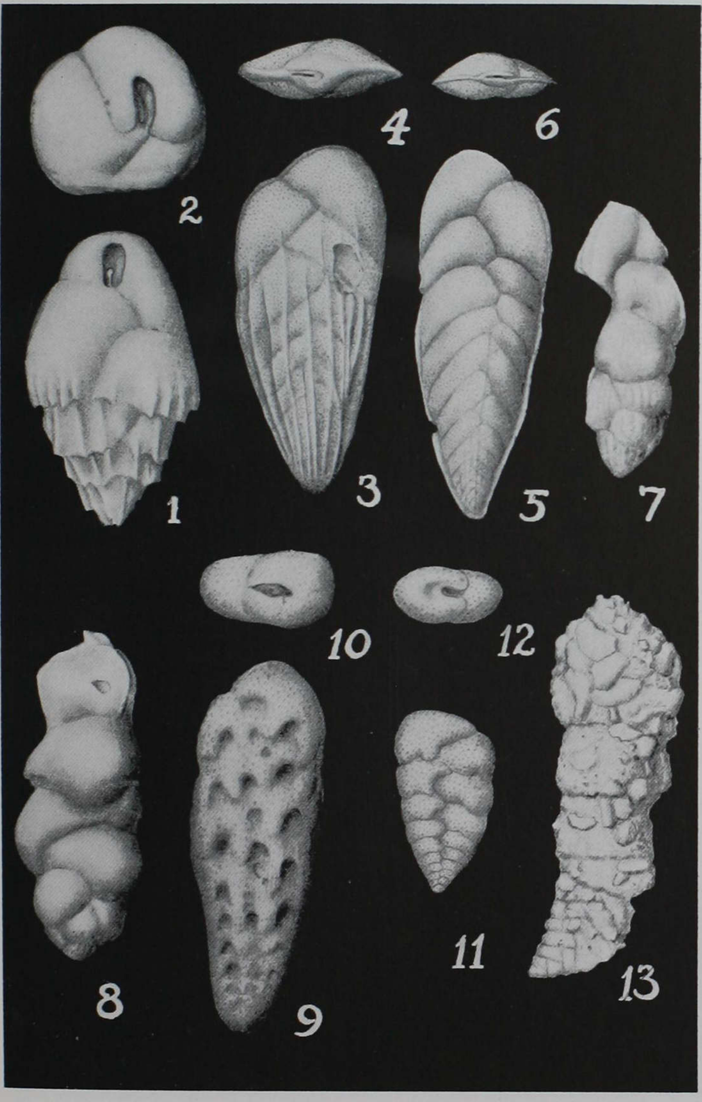
3, 4, 5, 6—*Bolivina marginata multicosta* Cushman. X113. 3, side view; 4, apertural view of the same specimen; 5, side view; 6, apertural view of the same specimen.

7, 8—*Angulogerina occidentalis* (Cushman). X113.

9, 10—*Bolivina floridana* Cushman. X73. 9, side view; 10, apertural view of the same specimen.

11, 12—*Bolivina plicatella mera* Cushman and Ponton. X100. 11, side view; 12, apertural view of the same specimen.

13—*Bigenerina nodosaria textularioidea* (Goës). X53.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Explanation to Plate 23

Figures

1—*Buliminella curta* Cushman. X86.

2—*Bulimina marginata* d'Orbigny. X133.

3, 4—*Cassidulina crassa* d'Orbigny. X113. 3, side view; 4, peripheral view of the same specimen.

5, 6—*Cassidulina laevigata carinata* Cushman. X180. 5, peripheral view; 6, side view of the same specimen.

7, 8—*Chrysalidinella pulchella* (Cushman). X113. 7, side view; 8, apertural view of the same specimen.

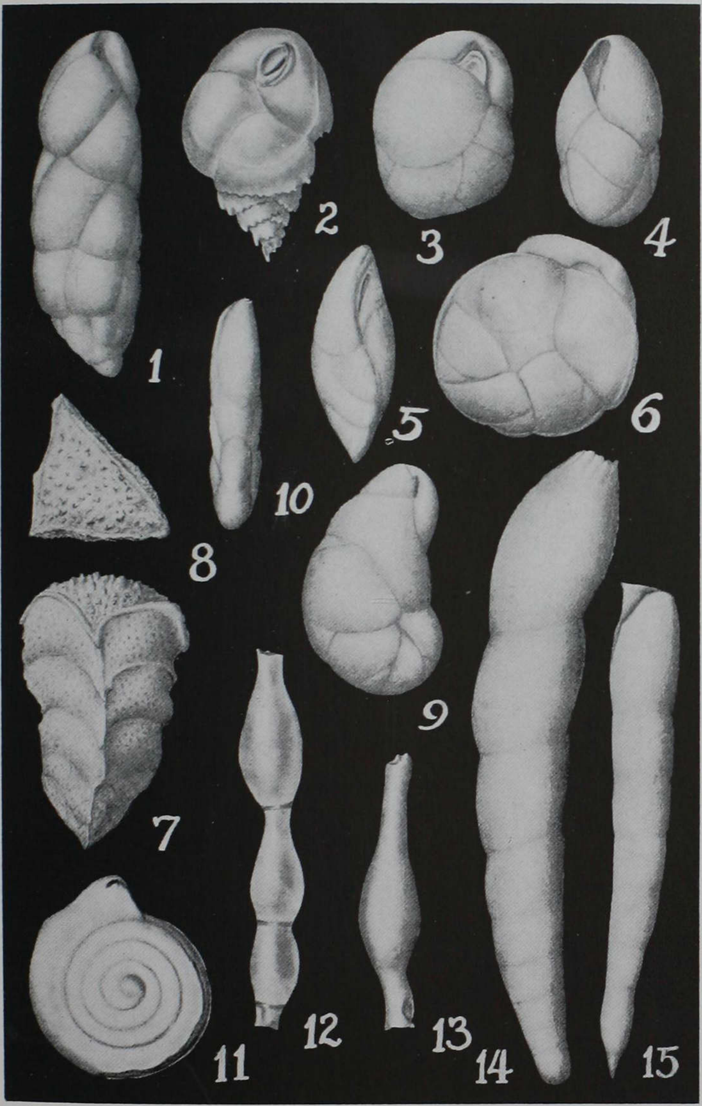
9, 10—*Cassidulinoides bradyi* (Norman). X113. 9, side view; 10, peripheral view of the same specimen.

11—*Cornuspira involvens* (Reuss). X113.

12, 13—*Dentalina pyrula* (d'Orbigny). X80.

14—*Dentalina communis* d'Orbigny. X66.

15—*Dentalina consobrina emaciata* Reuss.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Explanation to Plate 24

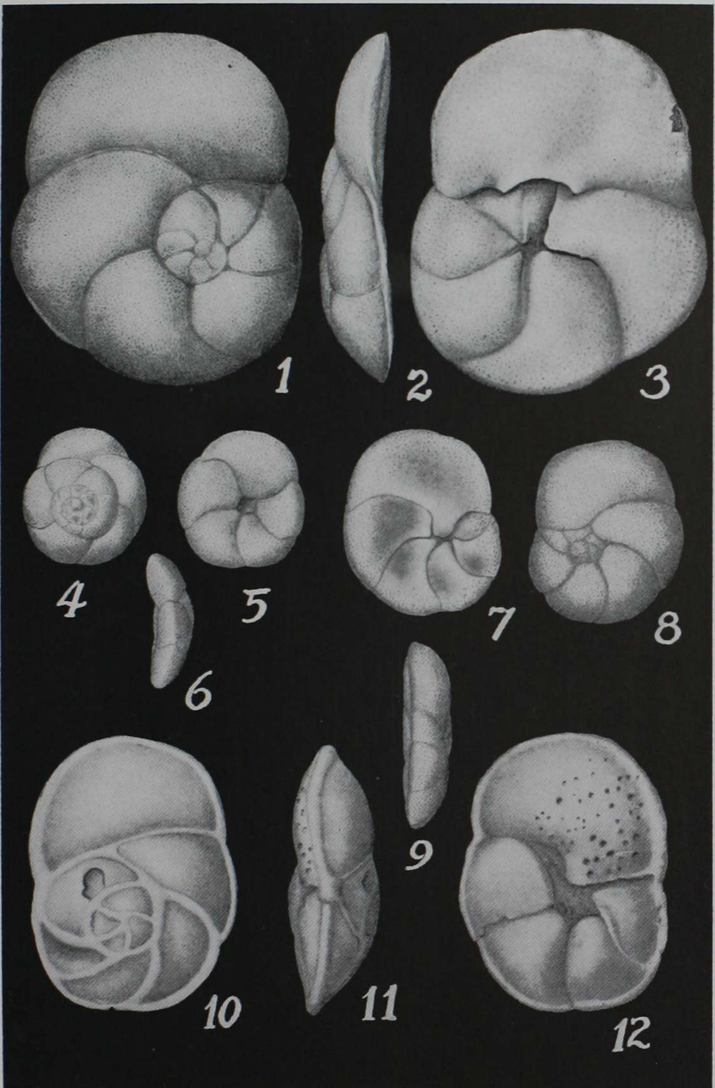
Figures

1, 2, 3—*Rotorbinella ? rosacea* (d'Orbigny). X40. 1, dorsal view; 2, peripheral view of the same specimen; 3, ventral view of the same specimen.

4, 5, 6—*Discorbis consobrina* (d'Orbigny). X73. 4, dorsal view; 5, ventral view of the same specimen; 6, peripheral view of the same specimen.

7, 8, 9—*Discorbis floridana* Cushman. X73. 7, ventral view; 8, dorsal view of the same specimen; 9, peripheral view of the same specimen.

10, 11, 12—*Poroeponides lateralis* (Terquem). X53. 10, dorsal view; 11, peripheral view of the same specimen; 12, ventral view of the same specimen.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Explanation to Plate 25

Figures

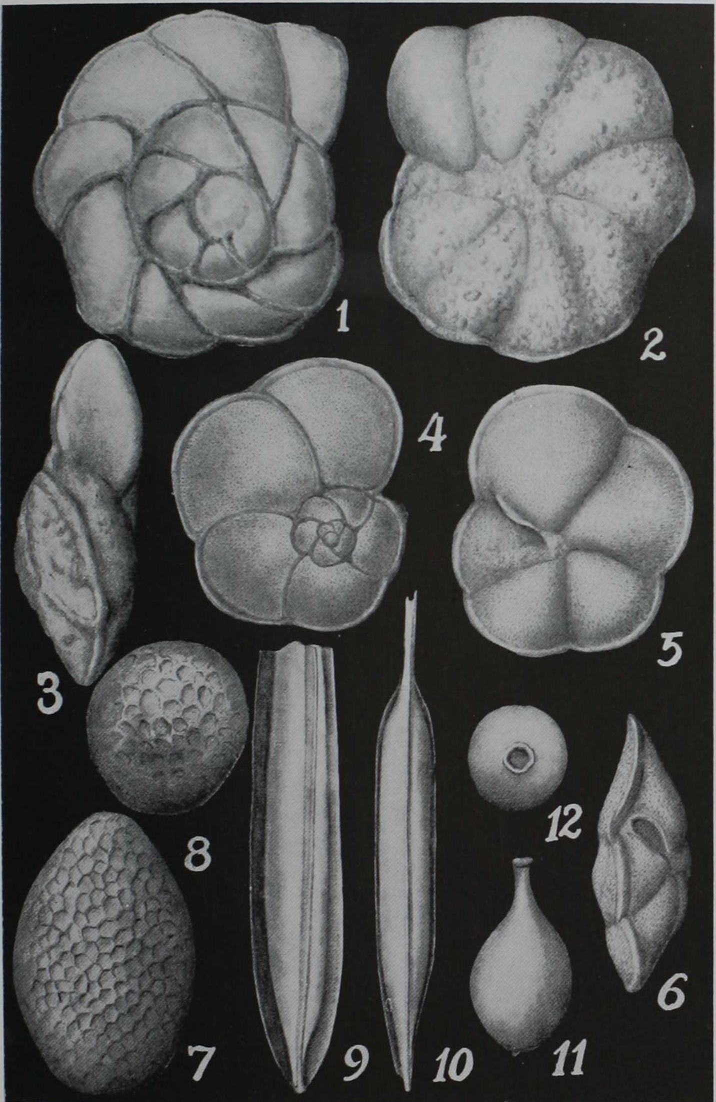
1, 2, 3—*Buccella mansfieldi* (Cushman). X86. 1, dorsal view; 2, ventral view of the same specimen; 3, peripheral view of the same specimen.

4, 5, 6—*Globorotalia menardii* (d'Orbigny). X60. 4, dorsal view; 5, ventral view of the same specimen; 6, peripheral view of the same specimen.

7, 8—*Oolina hexagona* (Williamson). X113. 7, side view; 8, apertural view of the same specimen.

9, 10—*Procerolagena gracilis* (Williamson). X53.

11, 12—*Lagena clavata* (d'Orbigny). X113. 11, side view; 12, apertural view of the same specimen.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Explanation to Plate 26

Figures

1—*Lagena substriata* Williamson. X113.

2, 3—*Fissurina orbignyana lacunata* (Burrows and Holland). X113. 2, side view; 3, apertural view of the same specimen.

4, 5—*Astrononion glabrella* (Cushman). X113. 4, side view; 5, apertural view of the same specimen.

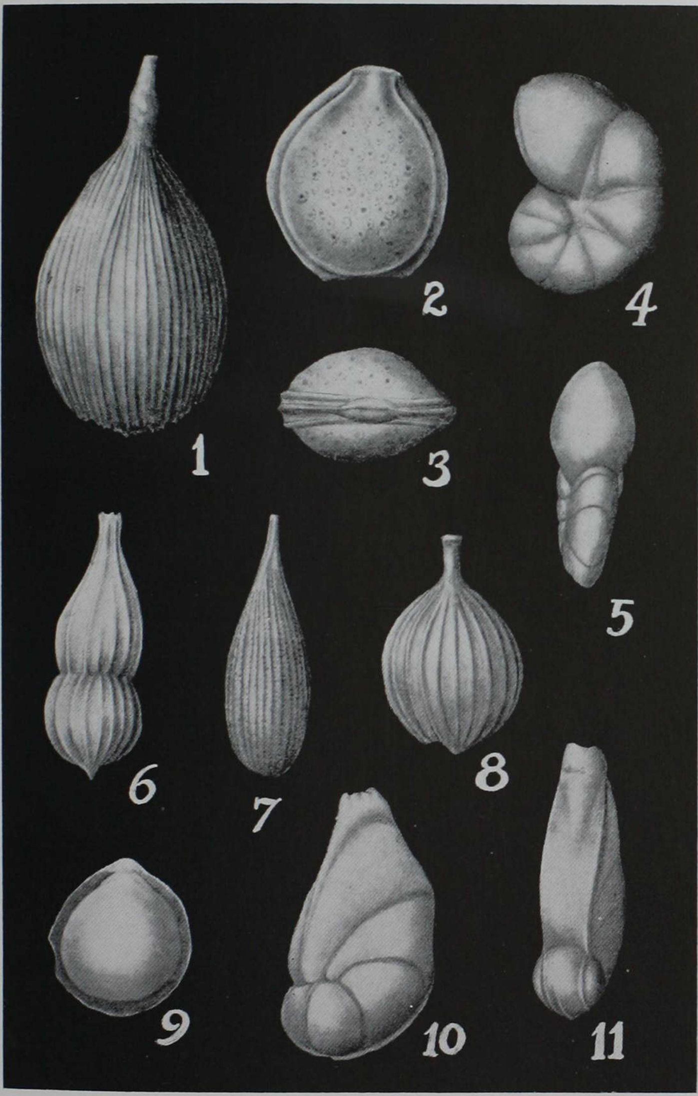
6—*Nodosaria catesbyi* d'Orbigny. X86.

7—*Fissurina* cf. *F. striato-punctata* (Parker and Jones). X113.

8—*Lagena sulcata* (Walker and Jacob). X113.

9—*Parafissurina marginata* (Walker and Jacob). X93.

10, 11—*Astacolus sp.* Cushman. X86. 10, side view; 11, peripheral view of the same specimen.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Explanation to Plate 27

Figures

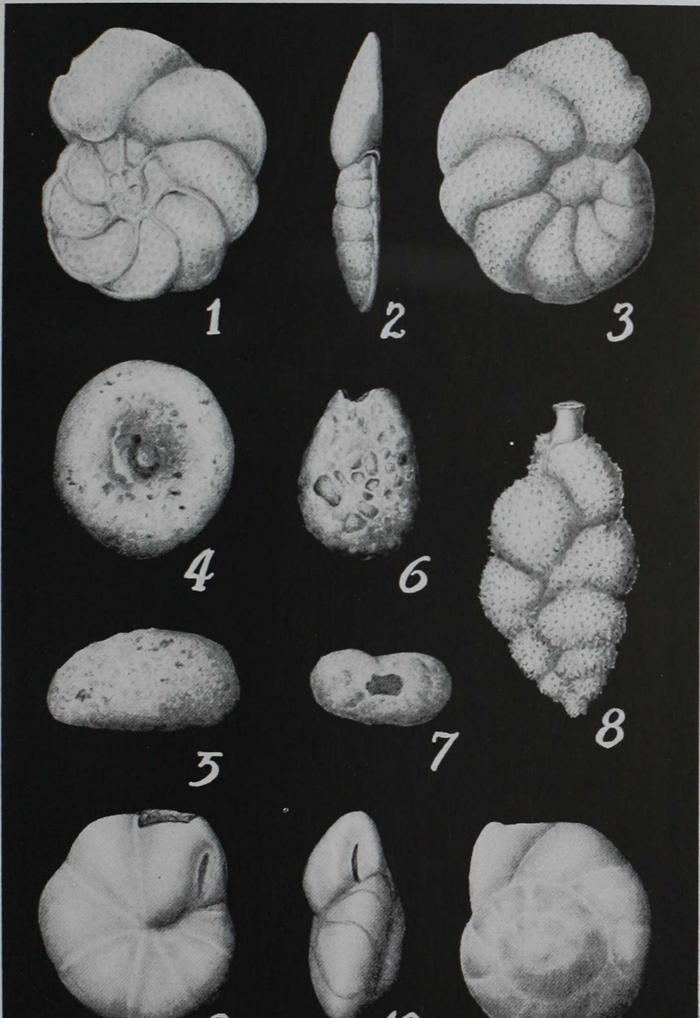
1, 2, 3—*Planulina depressa* (d'Orbigny). X60. 1, dorsal view; 2, peripheral view of the same specimen; 3, ventral view of the same specimen.

4, 5—*Leptodermella arenata* (Cushman). X113. 4, apertural view; 5, side view of the same specimen.

6, 7—*Proteonina difflugiformis* (H. B. Brady). X113. 6, front view; 7, apertural view of the same specimen.

8—*Uvigerina auberiana* d'Orbigny. X113.

9, 10, 11—*Epistominella pontoni* (Cushman). X180. 9, ventral view; 10, peripheral view of the same specimen; 11, dorsal view of the same specimen.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Explanation to Plate 28

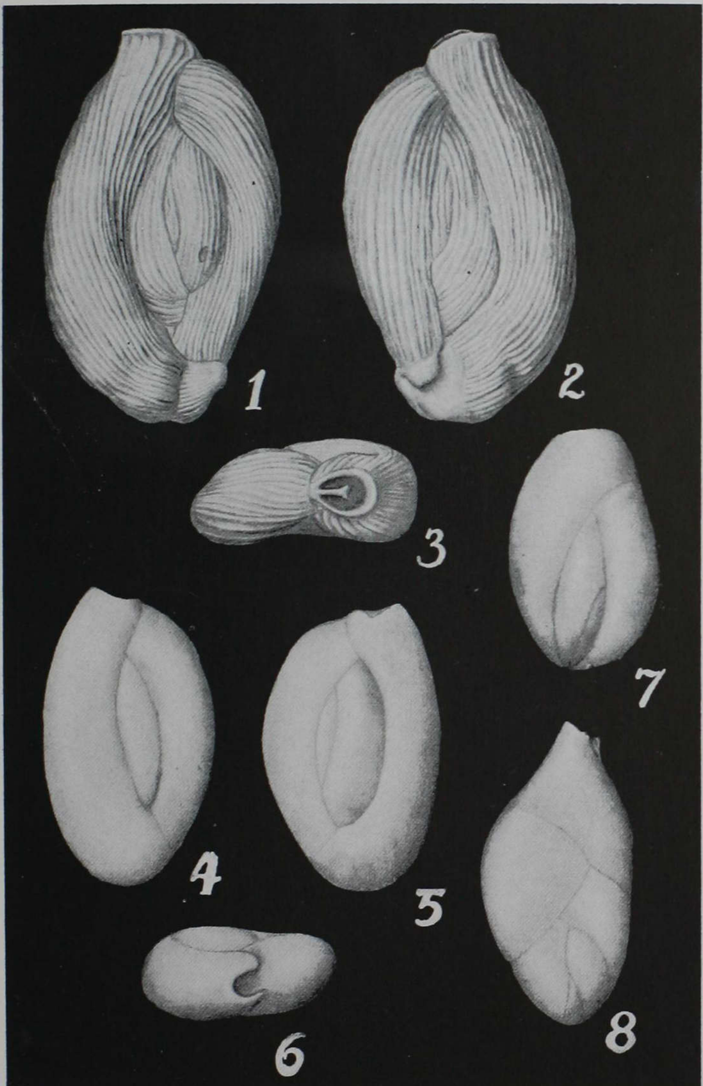
Figures

1, 2, 3—*Quinqueloculina costata* d'Orbigny. X43. 1, 2, opposite sides; 3, peripheral view of the same specimen.

4, 5, 6—*Quinqueloculina seminula* (Linné). X66. 4, 5, opposite sides; 6, apertural view of the same specimen.

7—*Sigmomorphina williamsoni* (Terquem). X86.

8—*Pseudopolymorphina dumblei* (Cushman and Applin). X66.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Explanation to Plate 29

Figures

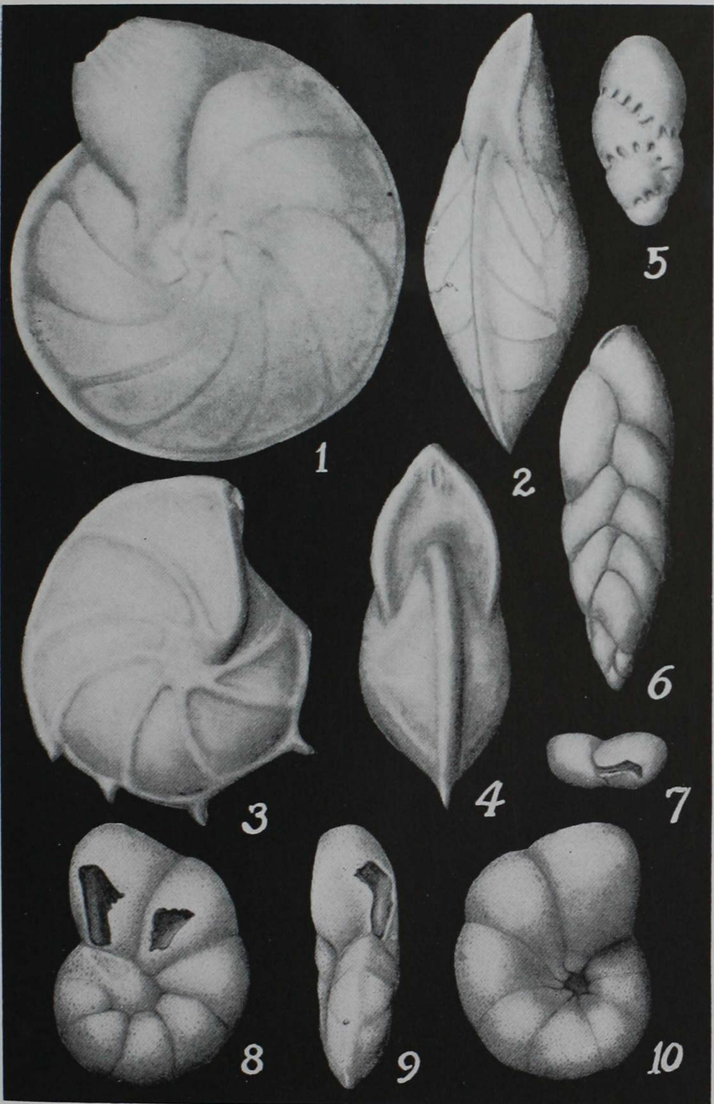
1, 2—*Robulus iota* (Cushman). X46. 1, side view; 2, apertural view of the same specimen.

3, 4—*Robulus americanus spinosus* (Cushman). X60. 3, side view; 4, apertural view of the same specimen.

5—*Virgulina* (*Virgulinella*) *gunteri curtata* Cushman and Ponton. X73.

6, 7—*Virgulina punctata* d'Orbigny. X86. 6, side view; 7, apertural view of the same specimen.

8, 9, 10—*Valvulineria floridana* Cushman. X86. 8, dorsal view; 9, peripheral view of the same specimen; 10, ventral view of the same specimen.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Explanation to Plate 30

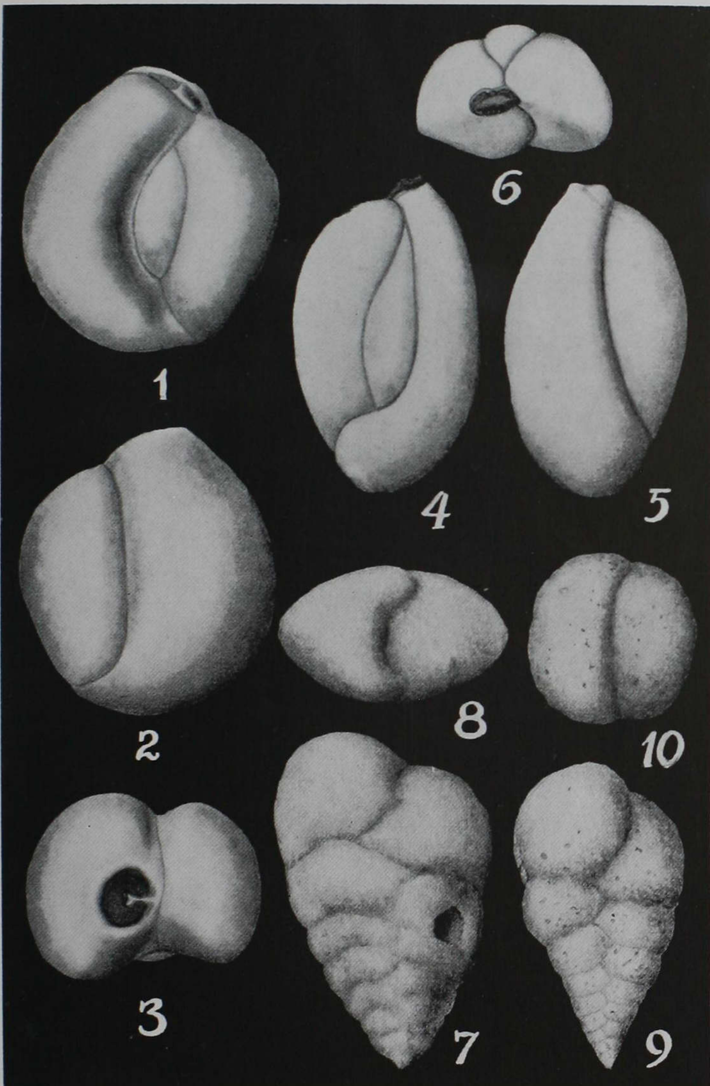
Figures

1, 2, 3—*Triloculina rotunda* d'Orbigny. X53. 1, 2, opposite sides; 3, apertural view of the same specimen.

4, 5, 6—*Triloculina schreiberiana* d'Orbigny. X60. 4, 5, opposite sides; 6, apertural view of the same specimen.

7, 8—*Textularia gramen* d'Orbigny. X86. 7, front view; 8, apertural view of the same specimen.

9, 10—*Textularia candeiana* d'Orbigny. X53. 9, front view; 10, apertural view.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Part III

CONTRIBUTION TO THE STUDY OF THE MIOCENE OF THE FLORIDA PANHANDLE

OSTRACODA

PART III

TABLE OF CONTENTS AND TAXONOMY

ILLUSTRATIONS

Part III

DESCRIPTION OF SPECIES

Suborder PODOCOPA Sars, 1865 (1866)
Family BAIRDIIDAE Sars, 1887
Subfamily BAIRDIINAE Sars, 1923
Genus BAIRDIA M'Coy, 1884
Bairdia chipolensis Puri, n. sp.
Plate 1, fig. 2; text fig. 1c

Carapace medium; oblong in dorsal view. Valves inequal, left conspicuously larger than the right. Dorsal margin regularly arched, ventral margin concave in the middle in the right valve, very slightly so in the left valve. Anterior margin broadly rounded in the ventral half; very noticeably oblique in the dorsal half. Posterior margin sharply pointed, triangular and acute. Surface of the carapace very finely pitted. Hinge normal to the genus.

This species differs from *B. laevicula* Edwards in its regularly arched dorsal margin and in its finely pitted surface.

The figured specimen came from the *Chipola* facies locality no. 12. This species also occurs frequently at the *Ecphora* facies locality no. 44.

Dimensions of holotype no. 2488, a complete specimen from locality no. 12; length .760 mm.; height .456 mm.

Bairdia laevicula Edwards
Plate 1, fig. 1; text fig. 1d

Bairdia laevicula Edwards, 1944, Jour. Paleontology, vol. 18, pp. 506, 507, pl. 85, figs. 3, 4.

This species was described originally from the Duplin marl of North Carolina. It occurs frequently at the *Arca* facies localities nos. 27 and 30.

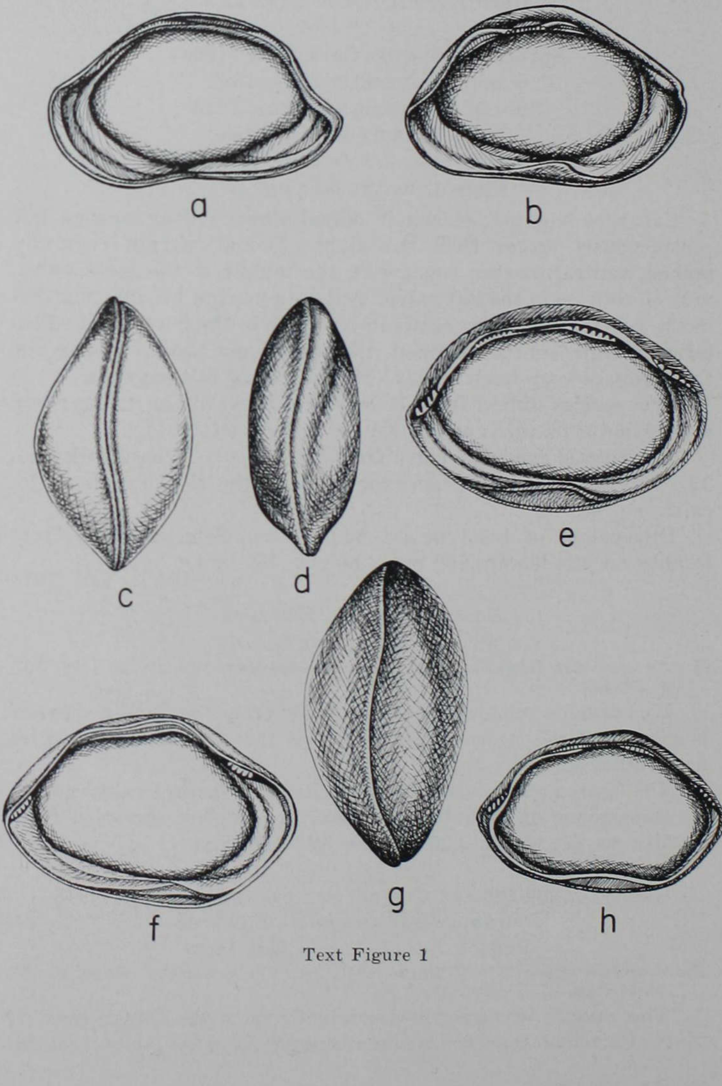
The figured specimen came from the *Arca* facies locality no. 27.

Dimensions of plesiotype no. 2487, a complete specimen from locality no. 27: length .828 mm.; height .490 mm.

Genus BAIRDOPPILATA Coryell, Sample and Jennings, 1935
Bairdoppilata triangulata Edwards
Plate 1, figs. 3, 4; text figs. 1a, b

Bairdoppilata triangulata Edwards, 1944, Jour. Paleontology, vol. 18, p. 507, pl. 85, figs. 5-7.

This species was described originally from the Duplin marl of North Carolina. It occurs frequently at the *Ecphora* facies localities



Text Figure 1

nos. 37, 39, 40, 43, 44 and *Cancellaria* facies localities nos. 53, 54 and questionably at locality no. 48. It seems to be restricted to the *Ecphora* and *Cancellaria* facies of the Choctawhatchee stage.

The figured specimens came from the *Ecphora* facies locality no. 43.

Dimension of plesiotype no. 2489, a right valve from locality no. 43: length .946 mm.; height .523 mm.; plesiotype no. 2490, a left valve from locality no. 43: length .878 mm.; height .557 mm.

Bairdoppilata willisensis Puri, n. sp.

Plate 1, figs. 5-8; text figs. 1e-h

Carapace large, lenticular in dorsal view, ovate in side view. Height-width ratio 1:1.25 to 1:1.5. Dorsal margin arched, ventral margin slightly concave in middle. Anterior broadly rounded in the right valve, subangular in the left valve. Posterior margin bluntly produced. Angulation in the anterior end higher than angulations in the posterior end. Marginal areas broad, marginal pore canals invisible. Hinge normal to the genus.

This species differs from *B. triangulata* Edwards in its ovate shape and by its blunt posterior angulation.

Named after the town of Willis, Calhoun County, Florida.

All of the figured specimens came from the Chipola facies locality no. 4. It also occurs at the Chipola facies localities nos. 1, 3, 6, 7, 9, 12 and the *Ecphora* facies locality no. 36.

Dimensions of holotype no. 2491, a left valve: length .980 mm.;

Explanation of text figure 1

All figures approximately X50. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b—*Bairdoppilata triangulata* Edwards, locality no. 43. a, plesiotype no. 2489, a right valve; b. plesiotype no. 2490, a left valve.

c—*Bairdia chipolensis* Puri, n. sp., locality no. 12, holotype no. 2488, dorsal view of a complete carapace.

d—*Bairdia laevicula* Edwards, locality no. 27, plesiotype no. 2487, dorsal view of a complete carapace.

e, f, g, h—*Bairdoppilata willisensis* Puri, n. sp., locality no. 4. e, paratype no. 2493, a left valve; f, holotype no. 2491, a left valve; g, paratype no. 2494, dorsal view of a complete carapace; h, paratype no. 2492, a left valve.

height .659 mm.; paratype no. 2492, a left valve: length .811 mm.; height .540 mm.; paratype no. 2493, a left valve: length .895 mm.; height .591 mm.; paratype no. 2494, a complete carapace: length .912 mm.; height .591 mm.

Genus BYTHOCYPRIS Brady, 1880

Bythocypris howei, Puri, n. sp.

Plate 1, figs. 14-16; text figs. 2e, f, g

Carapace medium, elongate, oblong in side view. Dorsal margin oblique in the anterior half; sharply rounded in posterior half; ventral margin slightly concave in the middle. Anterior margin rounded; posterior margin blunt and subangular. Surface of the carapace smooth and polished. Viewed from inside, the valves are moderately deep. Marginal areas broad. Pore canals and muscle scars obscured by the thickness of the carapace. Hinge articulates by means of a set of three bars, dorsally bound by grooves in the left valve. Right valve complimentary.

Named in honor of Dr. Henry V. Howe, Louisiana State University.

The figured specimens came from the *Ecphora* facies localities nos. 43 and 44. This species also occurs at the *Arca* facies localities nos. 23, 30 and *Cancellaria* facies locality no. 51. This species has to date been found only in the Choctawhatchee Stage.

Dimensions of the holotype no. 2454, a complete specimen from locality no. 43: length .591 mm.; height .287 mm.; paratype no. 2653, a left valve from locality no. 43: length .591 mm.; height .287 mm.; paratype no. 2655, a complete specimen from locality no. 44: length .760 mm.; height .388 mm.

Bythocypris minuta Puri, n. sp.

Plate 1, fig. 13; text fig. 2h

Carapace small, slender, elongate, almost three to one. Dorsal margin broadly arched; ventral margin almost straight, slightly concave in the middle. Anterior margin broadly rounded; posterior margin subangular; round in the lower half; oblique in the upper half. Surface of the carapace smooth and polished.

This species differs from *B. howei* in its considerably smaller size; dorsally and broadly arched, very elongate carapace.

The figured specimen came from the Chipola facies locality no. 1. It also occurs at the Chipola facies locality no. 10.

Dimensions of the holotype no. 2499, a complete specimen from locality no. 1: length .354 mm.; height .135 mm.

TABLE 1

RANGE OF FAMILY BAIRDIIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Bairdia chipolensis	——					——	
Bairdia laevicula					——		
Bairdoppilata willisensis	——					——	
Bairdoppilata triangulata						——	——
Bythocypris minuta	——						
Bythocypris howei					——	——	——
Paracypris chipolensis	——						
Paracypris choctawhatcheensis						——	——

Family CYPRIDAE Baird, 1846

Genus PARACYPRIS Sars, 1866

Paracypris chipolensis Puri, n. sp.

Plate 1, fig. 9; text fig. 2c

Carapace medium, subtriangular; lenticular in side view. Dorsal margin oblique, more so in the posterior half; ventral margin almost straight. Anterior end broadly rounded, posterior angular and sharp. Surface of the carapace smooth.

This species differs from *P. choctawhatcheensis* in being subtriangular with oblique dorsal margin and almost straight ventral margin.

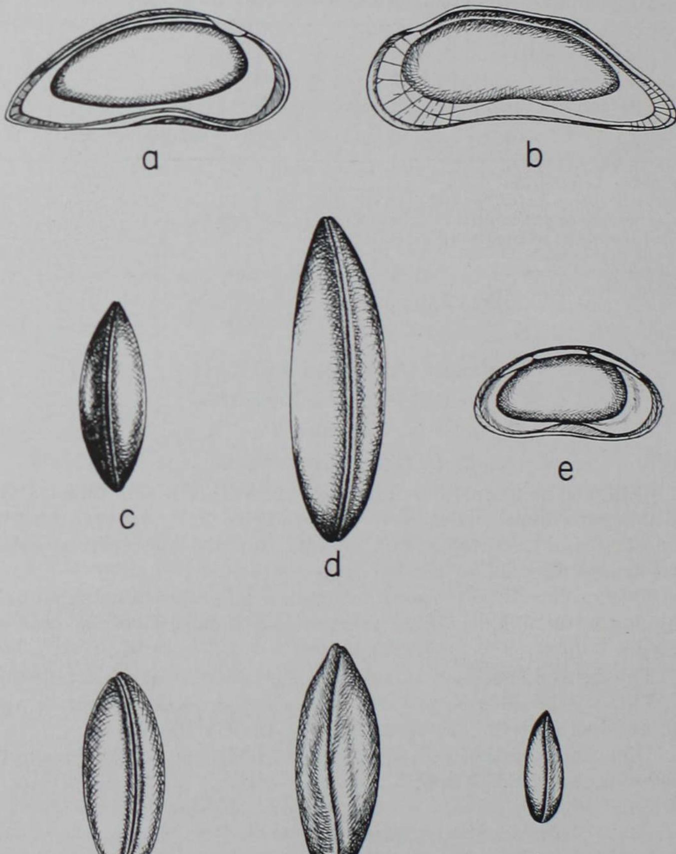
The figured specimen came from the Chipola facies locality no. 3. This species also occurs at Chipola facies localities nos. 9 and 10, and has to date been found only in the Chipola facies.

Dimension of the figured specimen, holotype no. 2495: length .540 mm.; height .270 mm.

Paracypris choctawhatcheensis Puri, n. sp.

Plate 1, figs. 10-12; text figs. 2a, b, d

Carapace large, elongate, two and a half to three to one. Dorsal margin arched; ventral margin gently concave. Anterior end oblique in the upper half; broadly rounded in the lower half. Posterior end sharply angular. Surface of the carapace smooth. Viewed from inside, the valves are moderately deep. Anterior margin broad with long, broadly spaced, bifurcating, marginal pore canals. Posterior margin narrow, with ten to twelve radial pore canals.



Text Figure 2

Hinge normal to the genus. There is a well-pronounced projecting flange in front of the hinge line in the left valve.

This species differs from *P. rosefieldensis* Howe and Law in having the greatest height slightly anterior to the middle, its upper half of the anterior end oblique and a very conspicuous projecting flange in front of the hinge line in the left valve.

The figured specimens came from the *Ecphora* facies locality no. 44 and *Cancellaria* facies locality no. 52. It also occurs at the following *Cancellaria* facies localities: 48, 50, 53, 54, 55, 57 and 58.

Dimensions of the figured specimens: paratype no. 2496, a left valve from locality no. 52: length .878 mm.; height .338 mm.; paratype no. 2497, a right valve from locality no. 52: length .963 mm.; height .338 mm.; holotype no. 2498, a complete specimen from locality no. 44: length 1.030 mm.; height .422 mm.

Family CYTHERIDAE Baird, 1850

Subfamily CYTHERIDEINAE Sars, 1925

Genus ANOMOCYTHERIDEA Stephenson, 1938

Anomocytheridea floridana (Howe and Hough)

Plate 2, fig. 10; text figs. 3a, b

Cytheridea floridana Howe and Hough, 1935, Florida Geol. Survey Bull. 13, pp. 10, 11, pl. 2, figs. 15, 16, 18; pl. 4, figs. 6, 10.

Anomocytheridea floridana (Howe and Hough), Stephenson, 1938, Jour. Paleon-

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Explanation of text figure 2

All figures approximately X50. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. 2, a, b, d—*Paracypris choctawhatcheensis* Puri, n. sp. a, paratype no. 2496, a left valve, locality no. 52; b, paratype no. 2497, a right valve, locality no. 52; d, holotype no. 2498, dorsal view of a complete carapace, locality no. 44.

c—*Paracypris chipolensis* Puri, n. sp., locality no. 3, holotype no. 2495, dorsal view of a complete carapace.

e, f, g—*Bythocypris howei* Puri, n. sp. e, paratype no. 2653, a left valve, locality no. 43; f, holotype no. 2654, dorsal view of a complete carapace, locality no. 43; g, paratype no. 2655, dorsal view of a complete carapace, locality no. 44.

h—*Bythocypris minuta* Puri, n. sp., locality no. 1, holotype no. 2499, dorsal view of a complete carapace.

tology, vol. 12, p. 142, pl. 23, fig. 15; pl. 24, figs. 7, 8; text figs. 2, 6, 19, 20.
Cytheridea (?) (*Anomocytheridea*) *floridana* Howe and Hough, Van den Bold, 1946, p. 82.

This species was described from the *Arca* facies (Howe and Hough in Howe et al., 1935, p. 11). Stephenson (1938, p. 142) noticed that it was the most common form in the *Arca* facies and observed its occurrence only in marine sediments.

The figured specimens came from the *Arca* facies locality no. 35. It also occurs frequently at the *Arca* facies locality nos. 25, 26, 28 and 30.

Dimensions of plesiotype no. 2665, a left valve from locality no. 35: length 1.119 mm.; height .608 mm.; plesiotype no. 2666, a right valve: length 1.183 mm.; height .591 mm.

Genus HAPLOCYTHERIDEA Stephenson, 1936
Haplocytheridea bassleri Stephenson
Plate 3, figs. 1-4; text figs. 4c-f

Cytheridea subovata Ulrich and Bassler, 1904, Maryland Geol. Surv. Miocene Report, p. 124, pl. 37, figs. 1-8 (not *Cythere subovata* Münster 1830, later changed to *Cytheridea subovata* by Egger 1858) not *Cytheridea subovata* Sutton and Williams (1939) = *Haplocytherida bastropensis* Sutton and Williams new name (1940).
Cytheridea subovata Ulrich and Bassler, Doeglas, 1931, Wetens. Med. Mijnbouw, no. 17, p. 44.
Cytheridea (*Haplocytheridea*) *subovata* Ulrich and Bassler, Stephenson, 1938, Jour. Paleontology, vol. 12, p. 134, pl. 23, fig. 23; pl. 24, figs. 9, 10; text fig. 3.
Cytheridea (*Haplocytheridea*) *subovata* Ulrich and Bassler, Smith, 1941 Amer. Assoc. Petroleum Geologists Bull. vol. 25, p. 279.
Haplocytheridea bassleri Stephenson, 1943, Jour. Paleontology, vol. 17, p. 206 (new name).
Haplocytheridea? cf. *H.*? *subovata* (Ulrich and Bassler), Swain, 1951, U. S. Geol. Surv. Prof. Paper 234-A, p. 22, figs. 19-20.

This species occurs at the Chipola facies localities nos. 1, 4, 6, 8, 9, 11, 12; Oak Grove facies locality no. 16; Shoal River facies localities nos. 17, 18, 19; *Yoldia* facies locality no. 21 and *Arca* facies localities nos. 24, 27, 30 and 37.

Dimensions of plesiotype no. 2675, a right valve from locality no. 24: length .997 mm.; height .591 mm.; plesiotype no. 2676, a left valve from locality no. 24: length 1.030 mm.; height .676 mm.; plesiotype no. 2677, a left valve from locality no. 24: length .963 mm.; height .574 mm.; plesiotype no. 2678, a complete carapace from locality no. 17: length .980 mm.; height .574 mm.; plesiotype no. 2679, a complete carapace from locality no. 1.

This species was described from the Calvert Miocene (Ulrich and Bassler). Stephenson (1938, p. 135) gave its range from the Chipola through the Shoal River but it is more abundant in the Oak Grove and the Shoal River. It is a brackish water form and is related to *H. floridana,* a marine species from which it can be distinguished easily, in its more ovate form, a lower cardinal angle, and a simple hinge structure and muscle scar pattern.

Haplocytheridea choctawhatcheensis (Howe and Stephenson)

Plate 2, figs. 3, 4, 5; text figs. 3, h, i

Cytheridea choctawhatcheensis Howe and Stephenson, 1935, Florida Geol. Survey Bull. 13, pp. 9, 10, pl. 2, fig. 11; pl. 4, fig. 9.
Cytheridea (*Leptocytheridea*) *choctawhatcheensis* Stephenson, 1938, Jour. Paleontology, vol. 12, p. 137, pl. 23, fig. 9; pl. 24, figs. 13, 14; text figs. 12, 17, 18.
Cytheridea (Leptocytheridea)? *choctawhatcheensis* Van den Bold, 1946, p. 82, pl. 7, figs. 13a, b.

This species was described from the Choctawhatchee Miocene and its range as given by Howe and Stephenson (in Howe et al 1935, p. 10) is from Chipola facies through the *Arca* facies. Stephenson (1938, p. 137) restricted it to the *Arca* facies and the forms previously included in it were described by him as new species.

The figured specimens came from the *Arca* facies locality no. 35. This species also occurs at the *Arca* facies localities nos. 25, 26, 28 and 30.

Dimensions of plesiotype no. 2658, a right valve: length .811 mm.; height .473 mm.; plesiotype no. 2659, a left valve: length .861 mm.; height .490 mm.; plesiotype no. 2660, a right valve: length .845 mm.; height .473 mm.

Haplocytheridea wadei (Stephenson)

Plate 3, figs. 5, 6; text fig. 3g

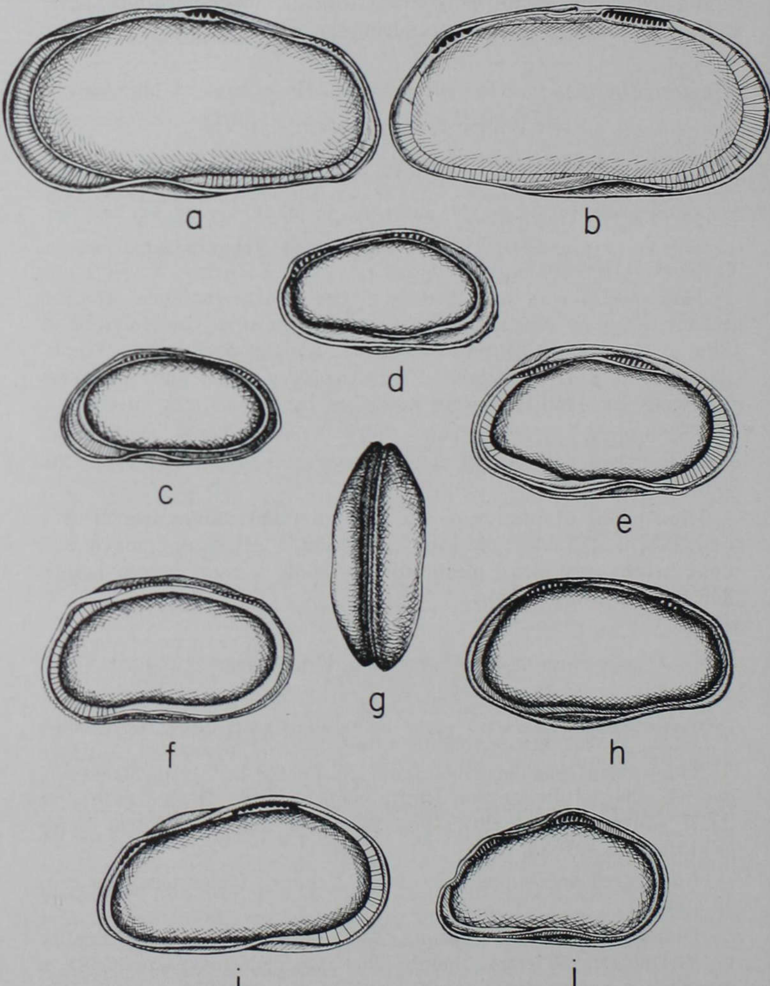
Cytheridea (Haplocytheridea) wadei Stephenson, 1941, Jour. Paleontology, vol. 15, pp. 428, 429, text figs. 3, 4, 14-18.

This species was described from the *Pecten* bed (uppermost *Ecphora*) exposed at Jackson Bluff, Leon County. It also occurs at the *Ecphora* facies localities nos. 36, 42, 43 and *Cancellaria facies* localities nos. 48 and 55.

All figured specimens came from *Ecphora* facies localities nos. 42 and 43.

Dimensions of plesiotype no. 2680, a right valve from locality no. 42: length .557 mm.; height .304 mm.; plesiotype no. 2681, a complete carapace from locality no. 43: length .659 mm.; height .304 mm.

This species has only been found in the *Ecphora* and *Cancellaria* facies of the Choctawhatchee stage.



Text Figure 3

Haplocytheridea okaloosensis (Stephenson)
Plate 2, fig. 9; text fig. 3j

Cytheridea (Leptocytheridea) okaloosensis Stephenson, 1938, Jour. Paleontology, vol. 12, p. 139, pl. 23, figs. 16; text fig. 8.

This species was reported from the Oak Grove facies locality no. 16. It was not found in any other locality.

Dimensions of the plesiotype no. 2664, a left valve from locality no. 16: length .709 mm.; height .439 mm.

Haplocytheridea chipolensis (Stephenson)
Plate 2, figs. 1, 2; text figs. 4a, b

Cytheridea (Leptocytheridea) chipolensis Stephenson, 1938, p. 136, pl. 23, fig. 18; text fig. 5.

This species was described from the type Chipola facies locality no. 12, and it also occurs at the Chipola facies localities nos. 4 and 11. All figured specimens came from Chipola facies locality no. 11.

Dimensions of plesiotype no. 2656, a left valve: length .692 mm.; height .371 mm.; plesiotype no. 2657, a right valve: length .676 mm.; height .371 mm.

This species has been observed only in the Chipola facies.

Explanation of Text Figure 3

All figures approximately X50. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b—*Anomocytheridea floridana* (Howe and Hough), locality no. 35. a, plesiotype no. 2666, a right valve; b, plesiotype no. 2665, a left valve.

c, d—*Haplocytheridea gardnerae* (Stephenson), locality no. 6. c, plesiotype no. 2671, a right valve; d, plesiotype no. 2672, a left valve.

e, f—*Haplocytheridea* cf. *H. proboscidiala* Edwards, locality no. 48. e, plesiotype no. 2673, a left valve; f, plesiotype no. 2674, a right valve.

g—*Haplocytheridea wadei* Stephenson, locality no. 43, plesiotype no. 2681, dorsal view of a complete carapace.

h, i—*Haplocytheridea choctawhatcheensis* (Howe and Stephenson), locality no. 35. i, plesiotype no. 2659, a left valve; h, plesiotype no. 2660, a right valve.

j—*Haplocytheridea okaloosensis* (Stephenson), locality no. 16, plesiotype no. 2664, a left valve.

Haplocytheridea gardnerae (Stephenson)
Plate 2, figs. 14-16; text figs. 3c, d

Cytheridea (Haplocytheridea) gardnerae Stephenson, 1938, Jour. Paleontology vol. 12, p. 132, pl. 23, fig. 5.

This species was described from the type Chipola facies locality no. 12. Typical specimens also occur at the Chipola facies localities nos. 4, 6 and 8.

All figured specimens came from the Chipola facies locality no. 6.

Dimension of plesiotype no. 2670, a left valve: length .709 mm.; height .388 mm.; plesiotype no. 2671, a right valve: length .676 mm.; height .338 mm.; plesiotype no. 2672, a left valve: length .676 mm.; height .338 mm.

Haplocytheridea cf. *H. proboscidiala* (Edwards)
Plate 2, figs. 17, 18; text figs. 3e, f

Cytheridea (Haylocytheridea) proboscidiala Edwards, 1944, Jour. Paleontology, vol. 18, pp. 508, 509, pl. 85, figs. 8-11.

This species was described from the Duplin marl of North Carolina. Florida specimens tentatively referred to this species occur at the *Ecphora* facies localities nos. 37, 38, 40, 44, 47, 48 and *Cancellaria* facies localities nos. 53, 57 and 58.

All figured specimens came from the *Cancellaria* facies locality no. 58.

Dimensions of plesiotype no. 2673, a left valve: length .878 mm.; height .490 mm.; plesiotype no. 2674, a right valve: length .845 mm.; height .473 mm.

Haplocytheridea waltonensis (Stephenson)
Plate 2, figs. 6-8; text figs. 4g, h

Cytheridea (Leptocytheridea) waltonensis Stephenson, 1938, Jour. Paleontology, vol. 12, p. 140, pl. 23, fig. 13; text fig. 15.
Cytheridea (Leptocytheridea) waltonensis Stephenson, Van den Bold, 1946, p. 82, pl. 8, fig. 3.
Cytheridea (Leptocytheridea) waltonensis Stephenson, Smith, 1941, Amer. Assoc. Petroleum Geologists Bull. vol. 25, p. 279.

This species was described from the Shoal River, locality no. 17. Typical members of this species occur at Shoal River facies localities nos. 17, 18 and 19 and the *Yoldia* facies locality no. 21.

All the figured specimens came from the Shoal River locality no. 18.

Dimensions of plesiotype no. 2661, a right valve: length .659 mm.; height .405 mm.; plesiotype no. 2662, a left valve: length .861 mm.; height .507 mm.; plesiotype no. 2663, a right valve: length .629 mm.; height .439 mm.; plesiotype no. 2682, a right valve: length .861 mm.; height .507 mm.

Haplocytheridea mansfieldi (Stephenson)
Plate 2, figs. 11-13; text figs. 4i, j

Cytheridea (Haplocytheridea) mansfieldi Stephenson, 1938, Jour. Paleontology, vol. 12, p. 133, pl. 23, fig. 14; text fig. 13.

This species was described from the type Chipola facies locality no. 12. It has not been found in any other locality.

All the figured specimens came from the Chipola facies locality no. 12.

Dimensions of plesiotype no. 2667, a right valve: length .659 mm.; height .338 mm.; plesiotype no. 2668, a right valve: length .642 mm.; height .321 mm.; plesiotype no. 2669, a left valve: length .777 mm.; height .405 mm.; plesiotype no. 2683, a left valve: length .794 mm.; height .405 mm.

Haplocytheridea mariannensis (Stephenson)

Cytheridea (Leptocytheridea) mariannensis Stephenson, 1938, Jour. Paleontology, vol. 12, p. 138, pl. 23, fig. 12.

This species was described from the type Chipola facies locality 12. Typical specimens occur at Chipola facies localities nos. 1, 8, 11 and 12.

Genus PARACYTHERIDEA G. W. Müller, 1894
Paracytheridea altila Edwards
Plate 3, figs. 15, 16; text figs. 5j, k

Paracytheridea altila Edwards, 1944, Jour. Paleontology, vol. 18, p. 512, pl. 85, figs. 20, 21.

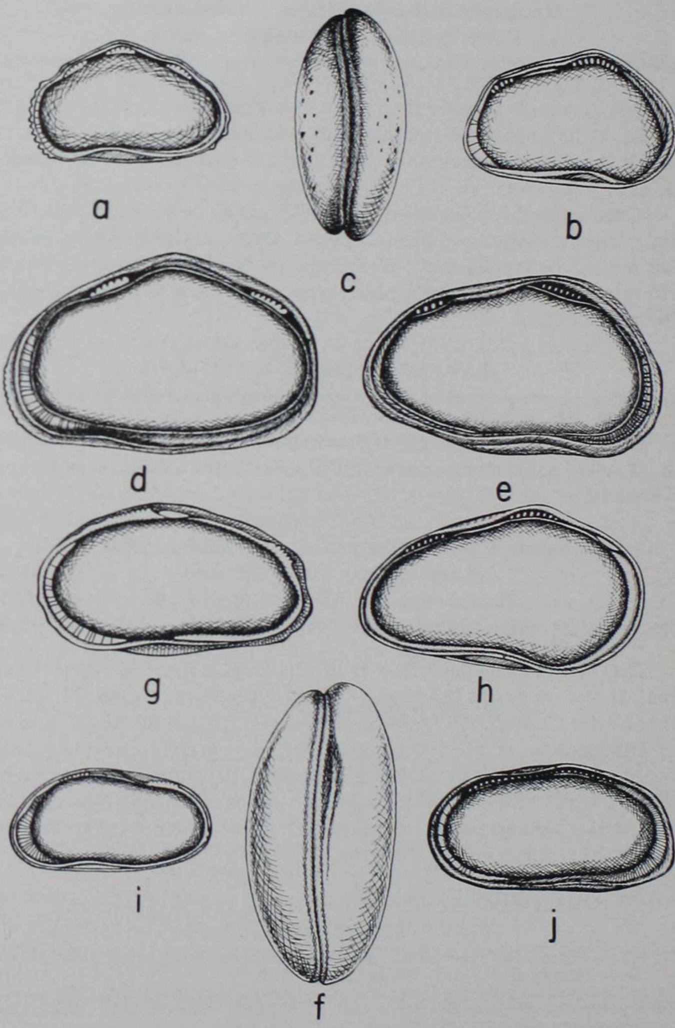
This species was described from the Duplin marl of North Carolina. It also occurs at the *Ecphora* facies localities nos. 36, 41, 42, 43, 47; and the *Cancellaria* facies localities nos. 48, 50, 52, 53, 55 and 58.

Dimensions of plesiotype no. 2692, a complete carapace from locality no. 58: length .659 mm.; height .338 mm.; plesiotype no. 2693, a right valve from locality no. 58: length .760 mm.; height .354 mm.; plesiotype no. 2694, a left valve from locality no. 43: length .811 mm.; height .388 mm.

Paracytheridea chipolensis Howe and Stephenson
Plate 3, figs. 12-14; text fig. 5c

Paracytheridea chipolensis Howe and Stephenson, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 36, pl. 3, figs. 5, 6.
Paracytheridea chipolensis Howe and Stephenson, Van den Bold, 1946, p. 87.
Paracytheridea chipolensis Howe and Stephenson, Smith, 1941, Am. Assoc. Petroleum Geologists Bull., vol. 25, p. 279.

This species was reported originally from the Chipola, the Oak Grove and the Shoal River and since has been reported in the Caribbean Miocene (Van den Bold, 1946) and the Shoal River



Text Figure 4

(Smith, 1941). It also occurs at the Chipola facies localities nos. 1, 3, 6, 7, 8, 9, 11, 12 and 13. This species has been found only in the Chipola facies.

Dimensions of the plesiotype no. 2689, a left valve: length .642 mm.; height .287 mm.; plesiotype no. 2690, a left valve: length .676 mm.; height .304 mm. All the figured specimens came from the Chipola facies locality no. 1.

Paracytheridea shoalriverensis Puri, n. sp.
Plate 3, figs. 8, 9; text figs. g-i

Carapace medium, subquadrate in side view. Dorsal margin slightly concave in the middle; ventral margin sinuous. Anterior end broadly rounded; posterior end acute and angular with a sharp ventral spine. Surface of the carapace reticulate post-dorsally; otherwise smooth. There is a very sharp ala which merges anterior margin in front and is bent posteriorly behind. Viewed from inside, the valves are moderately shallow. Both the marginal areas are moderately wide; marginal pore canal obscure; hinge normal to the genus.

This species could easily be identified by its prominent post-ventral spine and its very sharp ala.

Named after the Shoal River in Florida.

Explanation of Text Figure 4

All figures approximately X50. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b—*Haplocytheridea chipolensis* (Stephenson), locality no. 11. a, plesiotype no. 2657, a right valve; b, plesiotype no. 2656, a left valve.

c, d, e, f—*Haplocytheridea bassleri* Stephenson. c, plesiotype no. 2679, dorsal view of a complete carapace from locality no. 1; d, plesiotype no. 2675, a right valve from locality no. 24; e, plesiotype no. 2677, a left valve from locality no. 24; f, plesiotype no. 2678, a complete carapace from locality no. 17.

g, h—*Haplocytheridea waltonensis* (Stephenson), locality no. 36. g, plesiotype no. 2682, a right valve; h, plesiotype no. 2662, a left valve.

i, j—*Haplocytheridea mansfieldi* (Stephenson), locality no. 35. i, plesiotype no. 2668, a right valve; j, plesiotype no. 2683, a left valve.

Dimensions of the holotype no. 2685, a left valve: length .709 mm.; height .338 mm.; paratype no. 2686, a right valve: length .692 mm.; height .338 mm.; paratype no. 3030, a right valve: length .709 mm.; height .338 mm. All the figured specimens came from locality no. 17.

This species occurs frequently at the Oak Grove facies locality no. 15 and the Shoal River facies locality no. 17.

Paracytheridea vandenboldi Puri

Plate 3, fig. 7; text figs. 5a, b

Cytheropteron nodosum Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, pp. 129, 130, pl. 38, figs. 37-40 (not *Cytheropteron nodosum* Brady 1868).

Paracytheridea nodosa (Ulrich and Bassler), Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 37, pl. 3, fig. 7.

Paracytheridea nodosa (Ulrich and Bassler), Van den Bold, 1946, p. 86, pl. 16, fig. 7.

Paracytheridea nodosa (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 51, pl. 3, figs. 19-22.

Paracytheridea vandenboldi Puri, 1953c, Jour. Paleontology, vol. 27, p. 751 (new name).

This species was first described from the Chesapeake group at James River, Virginia, and since has been reported from the *Arca*

Explanation of Text Figure 5

All figures approximately X50. Type numbers refer to the Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

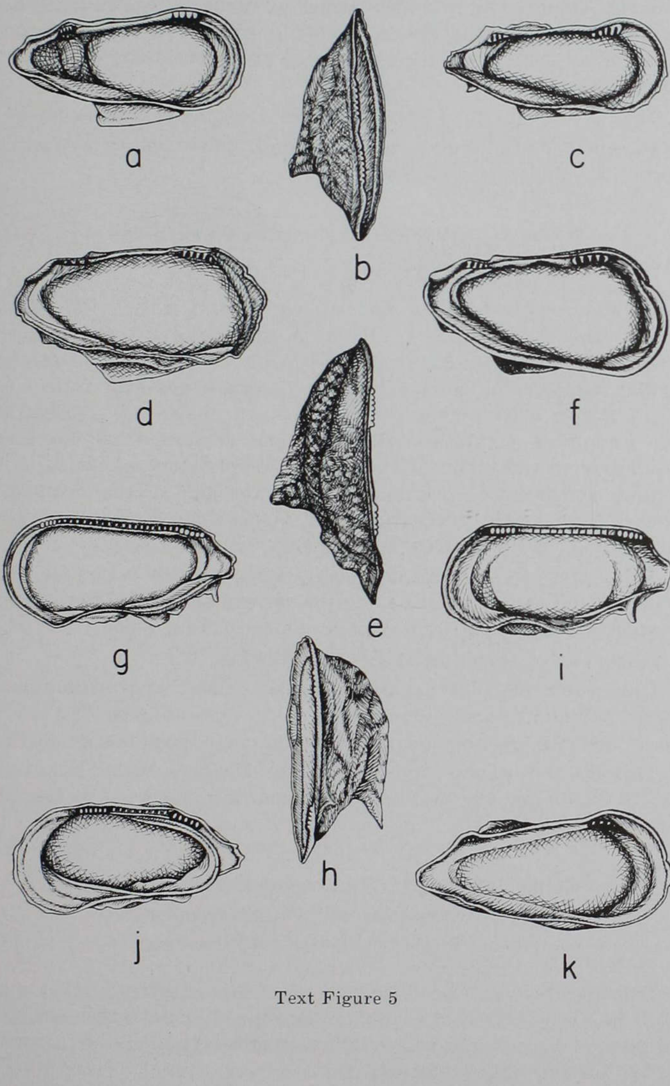
Figs. a, b—*Paracytheridea vandenboldi* Puri, locality no. 24. a, plesiotype no. 2684, a left valve; b, dorsal view of the same specimen.

c—*Paracytheridea chipolensis* Howe and Stephenson, locality no. 1, plesiotype no. 2690, a left valve.

d, e, f—*Paracytheridea washingtonensis* Puri, n. sp., locality no. 37. d, paratype no. 2688, a left valve; e, holotype no. 2687, side view of a left valve; f, inside view of the same specimen.

g, h, i—*Paracytheridea shoalriverensis* Puri, n. sp., locality no. 17. g, paratype no. 3030, a right valve; h, paratype no. 2686, a right valve side view; i, inside view of the same specimen.

j, k—*Paracytheridea altila* Edwards. j, plesiotype no. 2693, a right valve, locality no. 58; k, plesiotype no. 2694, a left valve, locality no. 43.



Text Figure 5

facies (Howe, et al., 1935) and the Miocene of the Caribbean region (Van den Bold, 1946). It also occurs at the *Arca* facies localities nos. 24, 25, 27, 28, 30. This species should prove to be a good marker for the *Arca* facies since it has not been observed in any other part of the section.

The figured specimen came from the *Arca* facies locality no. 24.

Dimensions of plesiotype no. 2684, a left valve: length .676 mm.; height .321 mm.

Paracytheridea washingtonensis Puri, n. sp.

Plate 3, figs. 10, 11; text figs. 5d-f

Carapace elongate, alate, nodose just in front of the middle near the posterior cardinal angle. Dorsal margin concave in the middle; ventral margin wavy. Anterior end broadly rounded; posterior end angular and sharp. Surface of the carapace coarsely reticulate except at the alate portion. The ala starts under the subcentral node and merges into the posterior end roughly three-quarters distance from the front; it is blunt and subtriangular; most of it occupies a subcentral position in the lower half of the carapace. Viewed from inside, the carapace is moderately shallow; margin areas broad. Hinge normal to the genus.

This differs from *P. chipolensis* in being coarsely reticulate and lacking the divaricating rib along the ventral keel and differs from *P. vandenboldi* in lacking a well-developed oblique sulcus.

Named after Washington County, Florida.

Dimensions of holotype no. 2687, a left valve: length .760 mm.; height .388 mm.; paratype no. 2688, a left valve: length .794 mm.; height .388 mm. All the figured specimens came from locality no. 37.

This species occurs commonly at the *Ecphora* facies localities nos. 37, 38, 39 and 40. So far as is known, this species is restricted to the *Ecphora* facies.

Genus PERISSOCYTHERIDEA Stephenson, 1938

Perissocytheridea gracilis Stephenson

Perissocytheridea gracilis Stephenson, 1938, Jour. Paleontology, vol. 12, p. 146, pl. 23, fig. 11.

This species was described from the Chipola facies locality no. 12. It has been observed rarely at the type Chipola facies locality and has not been found at any other locality. It should be a good marker for the Chipola facies.

TABLE 2

RANGE OF SUBFAMILY CYTHERIDEINAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Haplocytheridea mansfieldi	——						
Haplocytheridea gardnerae	——						
Haplocytheridea bassleri	——	——	——	——	——		
Haplocytheridea waltonensis			——	——			
Haplocytheridea okaloosensis		——					
Haplocytheridea mariannensis	——						
Haplocytheridea chipolensis	——						
Haplocytheridea choctawhatcheensis						——	——
Haplocytheridea wadei						——	——
Haplocytheridea cf. *H. probosocidiala*						——	——
Anomocytheridea floridana					——		
Perissocytheridea gracilis	——						
Paracytheridea vandenboldi					——		
Paracytheridea chipolensis	——	——	——				

Subfamily CYTHERURINAE G. W. Müller, 1894

Genus CYTHERURA Sars, 1865 (1866)

Cytherura bananaformis Coryell and Fields

Cytherura bananaformis Coryell and Fields, 1937, Amer. Mus. Novitates, No. 956, p. 12, figs. 14a-d.

This species occurs frequently at the *Ecphora* facies localities nos. 36, 37, 39, 40, 41, 42, 43 and *Cancellaria* facies locality no. 48.

Cytherura wardensis Howe and Brown

Plate 4, figs. 1-4; text fig. 6f

Cytherura wardensis Howe and Brown, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 36, pl. 1, figs. 23, 27; pl. 4, fig. 19.

Cytherura wardensis Howe and Brown, Edwards, 1944, Jour. Paleontology, vol. 18, p. 525, pl. 88, figs. 11, 12.

Typical specimens of this species occur at the *Arca* facies localities nos. 24, 27, 28, 30, 31, 32; *Ecphora* facies localities nos. 36, 41, 42, 43 and *Cancellaria* localities nos. 48, 50, 52, 55, 57 and 58.

Dimensions of plesiotype no. 2695, a complete carapace from locality no. 44: length .472 mm.; height .270 mm.; plesiotype no. 2696, a complete carapace from locality no. 43: length .490 mm.; height .202 mm.; plesiotype no. 2697, a complete carapace from locality no. 43: length .490 mm.; height .219 mm.

Genus CYTHEROPTERON Sars, 1865

Cytheropteron choctawhatcheensis Puri n. sp.

Plate 5, figs. 1, 2

Carapace medium, elongate. Dorsal margin almost straight; ventral margin slightly concave. Anterior end broadly rounded below, oblique above; posterior end blunt and subangular. Surface of the carapace reticulate with a subcentral depression which is closer to the ventral margin. There is a ventral blunt ala, rounded roughly three-quarters of the length from the anterior margin. Behind and above this ala is a depression which is fairly well-developed in most specimens. Hinge normal to the genus.

Dimensions of holotype no. 2708, a left valve: length .642 mm.; height .354 mm.; paratype no. 2709, a left valve: length .608 mm.; height .354 mm. All of the figured specimens came from locality no. 44.

This species occurs frequently at the *Ecphora* facies locality no. 44 and the *Cancellaria* facies locality no. 53.

Cytheropteron coryelli Puri, n. sp.

Plate 4, figs. 13-15, text fig. 6e

Carapace medium, elongate. Dorsal margin wavy, ventral margin almost straight. Anterior end broadly round below, oblique above; posterior end produced, angular, alate dorsally; median portion oblique; ventral portion alate. The ventral ala is sharp; its lower portion is almost straight, upper portion oblique. There is a well-marked subcentral tubercle which slopes towards the cardinal angles and also towards the antero-ventral margin, thus forming a star with the ventral ala as one of its limbs. Surface of the carapace ornamented with irregular pattern of pits. Marginal pore canals few and broadly spaced. Hinge normal to the genus.

Named for Dr. H. N. Coryell, Columbia University.

Dimensions of holotype no. 2706, a left valve from locality no. 53: Length .574 mm.; height .287 mm.; paratype no. 2707, a complete carapace from locality no. 58: length .608 mm.; height .304 mm.

This species occurs frequently at the *Ecphora* facies locality no. 37 and *Cancellaria* facies localities nos. 53 and 58.

Cytheropteron leonensis Puri, n. sp.

Plate 4, figs. 11, 12; text figs. 6c, d

Carapace small, subtriangular, oblong-ovate in side view. Dorsal margin arched, ventral margin convex in the middle. Anterior end broadly rounded below, oblique above; posterior margin triangular and produced. Surface of the carapace striated; striae parallel to the ventral margin; three of the most ventral striae very prominent. Viewed from inside, the valves are moderately deep; both the anterior and posterior margins narrow. Hinge of the right valve with a crenulate anterior tooth, a crenulate posterior tooth and a connecting groove.

This species could be easily recognized by its subtriangular striated carapace.

Named after the County of Leon, Florida.

Dimensions of the holotype no. 2704, a complete carapace from locality no. 44: length .507 mm.; height .236 mm.; paratype no. 2705, a right valve from locality no. 48: length .405 mm.; height .270 mm.

This species occurs frequently at *Arca* facies localities nos. 27, 28, 30, 32; *Ecphora* facies localities nos. 37, 38, 39, 43, 44 and *Cancellaria* facies localities nos. 48, 50, 52, 53, 57 and 58.

Cytheropteron talquinensis Puri, n. sp.

Plate 5, figs. 5, 6, 7

Carapace medium, wedge-shaped in dorsal view. Dorsal margin arched; ventral margin sinuous. Anterior end broadly rounded; posterior end subtriangular and sharply produced. Surface of the carapace coarsely reticulate. The ventral ala is subcentral in position; slightly moved toward the posterior. It is very sharp, pointed and well-developed and coarsely reticulate. Viewed from inside, the valves are deep; marginal areas wide. Hinge normal to the genus.

This species could easily be identified by its well-developed, almost subcentrally, ventral ala and a coarsely reticulate carapace.

Named after Lake Talquin, Leon County, Florida.

Dimensions of holotype no. 2713, a complete carapace: length .625 mm.; height .371 mm.; paratype no. 2712, a right valve: length .625 mm.; height .371 mm. All the figured specimens came from locality no. 44.

This species occurs frequently at the *Ecphora* facies localities nos. 37, 38, 39, 40, 44 and the *Cancellaria* facies locality no. 49.

Cytheropteron wardensis Puri. n. sp.

Plate 5, figs. 3, 4; text figs. 6a, b

Carapace small, alate. Dorsal margin strongly arched; ventral margin strongly concave in front; arched behind. Dorsal margin broadly rounded; ventral margin angular and sharp. Surface of the carapace smooth except for six rows of oblique, pitted, furrows and ridges in the posterior half. The ventral ala is blunt and small; with a well-developed ridge around it. Viewed from inside the valves are moderately deep; margin areas broad; marginal pore canals obscure. Hinge normal to the genus.

This species could easily be identified by its six rows of oblique, pitted furrows and ridges and its ventral ridged ala.

Named after the town of Ward, Leon County, Florida.

Dimensions of holotype no. 2710, a right valve: length .523 mm.; height .321 mm.; paratype no. 2711, a complete carapace: length .540 mm.; height .338 mm. All the figured specimens came from locality no. 44.

This species occurs frequently at the *Ecphora* facies localities nos. 38, 39, 40, 44 and the *Cancellaria* facies localities nos 48, 50, 53 and 54.

Explanation of Text Figure 6

All figures approximately X75. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b—*Cytheropteron wardensis* Puri, n. sp., locality no. 44. a, holotype no. 2710, a right valve; b, paratype no. 2711, dorsal view of a complete carapace.

c, d—*Cytheropteron leonensis* Puri, n. sp., c, holotype no. 2704, dorsal view of a complete carapace, locality no. 44; d, paratype no. 2705, a right valve, locality no. 52.

e—*Cytheropteron coryelli* Puri, n. sp., locality no. 53, holotype no. 2706, a left valve.

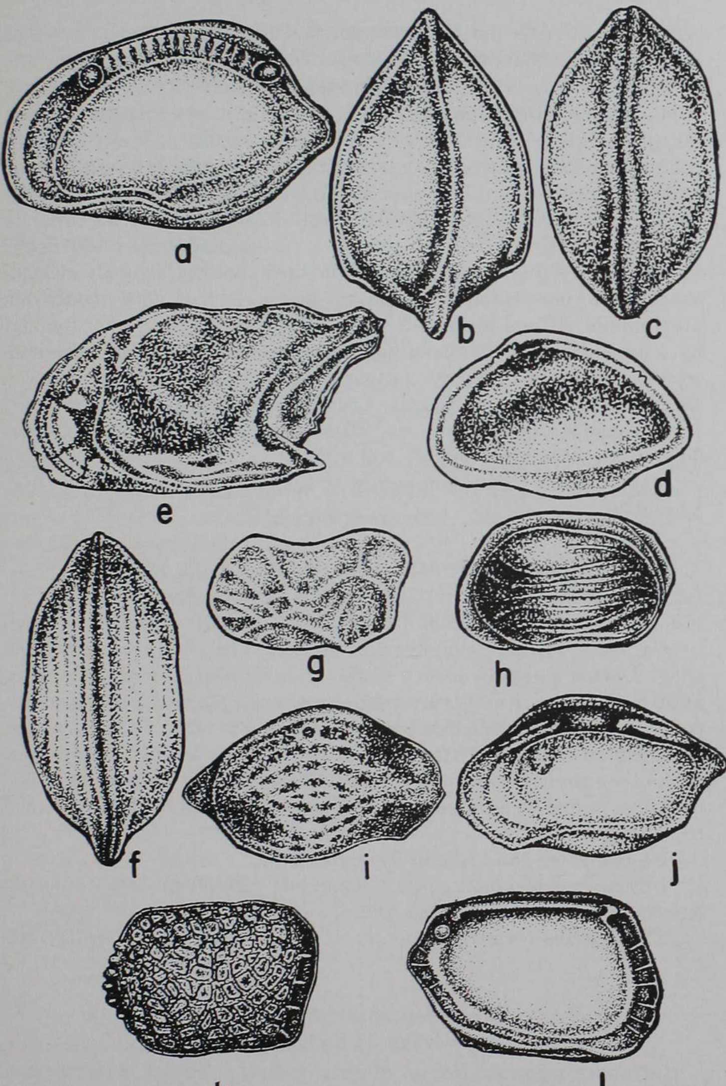
f—*Cytherura wardensis* Howe and Brown, locality no. 43, plesiotype no. 2696, dorsal view of a complete carapace.

g—*Kangarina chipolensis* Puri, n. sp., locality no. 1, holotype no. 2703, a left valve.

h—*Kangarina jacksonbluffensis* Puri, n. sp., locality no. 44, holotype no. 2698, left valve view of a complete carapace.

i, j—*Kangarina howei* Puri, n. sp., locality no. 44. i, holotype no. 2700, a right valve; j, inside view of the same specimen.

k, l—*Eucytherura weingeisti* Puri, n. sp., locality no. 30, holotype no. 2701, a left valve. k, external view; l, internal view.



Text Figure 6

Genus EUCYTHERURA Müller, 1894

Eucytherura weingeisti Puri, n. sp.

Plate 4, fig. 8; text figs. 6k, l

Carapace minute, subquadrate. Dorsal margin sinuous, ventral margin slightly concave in the middle. Anterior end broadly rounded in the upper quarter, very oblique and truncated; posterior end produced, subangular and stubby with a tuff of six to seven spines. Surface of the carapace reticulate; subcentral tubercle prominent. Viewed from inside, the valves are moderately deep; anterior margin broad with seven to eight straight, broadly spaced, short radial pore canals; posterior margin reduced with about four pore canals. Hinge in the left valve with an anterior socket flanked by extension of the connecting hinge bar and a similar posterior socket. Hinge of the right valve complimentary.

Named for Leo Weingeist, Creole Petroleum Corporation.

Dimensions of holotype no. 2701, a left valve from locality no. 30: length .354 mm.; height .202 mm.

This species occurs commonly at the *Arca* facies localities nos. 24 and 30.

Genus KANGARINA Coryell and Fields, 1937

Kangarina chipolensis Puri, n. sp.

Plate 4, fig. 10; text fig. 6g

Carapace minute, roughly rectangular; shaped like an inverted shoe. Dorsal margin concave in the middle; ventral margin convex anteriorly; oblique and truncated posteriorly. Anterior end broadly rounded; posterior end produced dorsally. Surface of the carapace ornamented with an intricate set of raised sinuous ribs which cross each other toward the anterior end. Posteriorly a distinct oval depression, bound by a raised rib, is situated ventrally. Hinge normal to the genus.

Named after the Chipola River, Florida.

Dimensions of holotype no. 2703, a left valve from locality no. 1: length .354 mm.; height .185 mm.

This species occurs frequently at the Chipola facies locality no. 1.

Kangarina howei Puri, n. sp.

Plate 4, fig. 7; text figs. 6i, j

Carapace minute. Dorsal margin arched; ventral margin concave in front; convex behind. Anterior end broadly rounded dorsally, oblique ventrally. Posterior end acute, triangular and compressed. Surface of the carapace ornamented with ten to eleven raised ridges, alternating with rows of pits and three depressions; one situated towards the anterior cardinal angle, the other two anteroventrally and posteroventrally. These depressions are distinct and characteristic. Hinge normal to the genus.

Named in honor of Dr. Henry V. Howe, Louisiana State University.

Dimensions of holotype no. 2700, a right valve from locality no. 30: length .321 mm.; height .219 mm.

This species occurs frequently at the *Ecphora* facies locality no. 44.

Kangarina jacksonbluffensis Puri, n. sp.

Plate 4, figs. 5, 6, text fig. 6h

Carapace minute, suboval. Dorsal margin wavy; ventral margin slightly convex. Anterior end broadly rounded above, oblique below; posterior end subtriangular; somewhat compressed. Surface of the carapace ornamented with seven to eight ribs that are roughly parallel toward the posterior end but are curved anteriorly. Hinge normal to the genus.

Named after Jackson Bluff, Leon County, Florida.

Dimension of holotype no. 2698, a complete carapace from locality no. 44: length .354 mm.; height .185 mm.; paratype no. 2699,

TABLE 3

RANGE OF SUBFAMILY CYTHERURINAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Cytherura wardensis					—	—	—
Cytherura bananaformis						—	—
Cytheropteron leonensis					—	—	—
Cytheropteron choctawhatcheensis						—	—
Cytheropteron coryelli						—	—
Cytheropteron talquinensis						—	—
Cytheropteron wardensis						—	—
Eucytherura weingeisti					—		
Kangarina chipolensis	—						
Kangarina quellita					—		—
Kangarina howei						—	
Kangarina jacksonbluffensis						—	

a left valve from locality no. 44: length .354 mm.; height .185 mm.

This species occurs frequently at the *Ecphora* facies localities nos. 43 and 44.

Kangarina quellita Coryell and Fields
Plate 4, fig. 9

Kangarina quellita Coryell and Fields, 1937, Am. Mus. Novitates, No. 956, p. 13, pl. 13, figs. 15a, b, c.

Typical specimens of this species occur at the *Arca* facies localities nos. 27, 30 and *Cancellaria* facies localities nos. 48, 50 and 52.

Dimensions of plesiotype no. 2702, a right valve from locality no. 30: length .354 mm.; height .185 mm.

Subfamily BRACHYCYTHERINAE Puri, new subfamily
Type genus: BRACHYCYTHERE Alexander, 1933

Carapace subquadrate to subovate, surface smooth, pitted or reticulate, inflated vertically with a well-developed ala. Hingement essentially crenulate, valves articulate by means of terminal crenulate teeth, sockets and median crenulate grooves and flanges. Marginal area wide, radial pore canals are variable in number but are generally long and closely spaced, sometimes branching. Line of concrescence and inner margin coincide. Muscle scars in two or three separate groups.

The subfamily includes the following genera:

Brachycythere Alexander 1933, p. 204; genotype *Cythere sphenoides* Reuss, 1854, p. 141, pl. 26, fig. 2.

Alatacythere Murray and Hussey, 1942, pp. 169-171, pl. 27, figs. 10, 11; text fig. 1, figs. 2, 10; genotype *Cythereis (Pterygocythereis?) alexanderi* Howe and Law, 1936, pp. 42, 43, pl. 4, fig. 23, pl. 5, fig. 5 [not *Cythereis alevanderi* Morrow, 1934, p. 203, pl. 31, figs. 14a-c] = *Alatacythere ivani* Howe (1951, p. 538), n. name.

Genus BRACHYCYTHERE Alexander, 1933

Brachycythere Alexander, 1933, p. 204; 1934, p. 215; Van Veen, 1935, p. 26; Murray and Hussey, 1942, p. 174; Van den Bold, 1946, p. 28; Stephenson, 1946, p. 331.

Genotype: *Cythere sphenoides* Reuss, 1854, p. 141, pl. 26, fig. 2.

Carapace large, subquadrate to subovate; valves inequal (left larger than right). Anterior end broadly and obliquely rounded; posterior end narrower than the anterior and compressed. Both dorsal and ventral margins arched. Surface of the carapace smooth, pitted or reticulate. Carapace inflated ventrally with a well-developed ala. Hinge in the right valve with an anterior rounded, smooth to crenulate tooth, a crenulate postjacent and a posterior elongate crenulate tooth. The anterior and posterior elements of the hingement are connected by a crenulate groove. Hinge of the left valve complimentary. Muscle scar pattern consists of a vertical row of four scars; in front of this vertical row is another vertical row of two scars, the upper one is heart-shaped; anterior to the second vertical row, there is another heart-shaped scar. Marginal areas are broad, radial pore canals are numerous, and closely spaced with a tendency to branch in the antero-ventral region.

Range: Cretaceous to Recent.

Genus BRACHYCYTHERE Alexander, 1933

Brachycythere miocenicus Puri, n. sp.

Text figs. 7a-c

Carapace large, subovate in side view. Dorsal margin almost straight, ventral margin concave anterior to the middle. Anterior end broadly rounded below and oblique above; and is flanked by a thin raised rim. The posterior end bluntly produced and compressed. Surface of the carapace reticulate; eleven to twelve raised ribs with alternating pitted furrows. The dorsal-most furrow has eleven to twelve subrectangular pits. There is a gradual reduction in the number of pits per each furrow towards the venter. Viewed from inside, the valves are deep. Both the anterior and the posterior margins are moderately wide; radial pore canals long, straight and numerous. Hinge of the right valve with anterior tooth and postjacent socket and a posterior cusped tooth connected by a groove. Muscle scar pattern and other internal features normal to the genus.

Dimensions of holotype no. 2718, a left valve from locality no. 43: length .963 mm.; height .591 mm.

This species occurs commonly at the *Ecphora* facies locality no. 43.

Subfamily CYTHERINAE Sars, 1925

Genus CYTHERE O. F. Müller, 1785

Cythere apalachicolensis Puri, n. sp.

Plate 5, figs. 8, 9; text figs. 7d-g

Carapace large, subovate. Dorsal margin arched; ventral margin slightly convex in the middle. Anterior end broadly rounded below; oblique above; posterior end slightly compressed. Surface of the carapace pitted. Viewed from inside, the valves are moderately deep. Both the anterior and posterior margins are wide. Radial pore canals straight and numerous. Hinge of the right valve consists of an anterior cusped tooth, an adjacent socket and a posterior cusped tooth connected by a groove. Hinge of the left complimentary.

Named after the Apalachicola River, Florida.

Dimensions of holotype no. 2714, a left valve: length .929 mm.; height .574 mm.; paratype no. 2715, a right valve: length .878 mm.; height .490 mm. All of the figured specimens came from locality no. 52.

This species occurs frequently at the *Ecphora* facies localities nos. 37, 40, 42, and the *Cancellaria* facies localities nos. 52, 54 and 58, and so far as is known is confined to these facies.

Cythere redbayensis Puri, n. sp.

Plate 5, figs. 10, 11; text figs. 7h, i

Carapace, medium oblong. Dorsal margin almost straight; slightly convex at the anterior cardinal angle; ventral margin convex in the middle. Anterior end broadly rounded below, oblique above; posterior end slightly compressed. Surface of the carapace smooth except for scattered normal pore canal pits. Viewed from inside, the valves are moderately deep. Both the anterior and posterior margins are moderately wider. Radial pore canals, about twenty to twenty-five in the anterior margin, straight, closely spaced, sometimes forked. Hinge and line of concrescence normal to genus.

Named after the town of Redbay, Walton County, Florida.

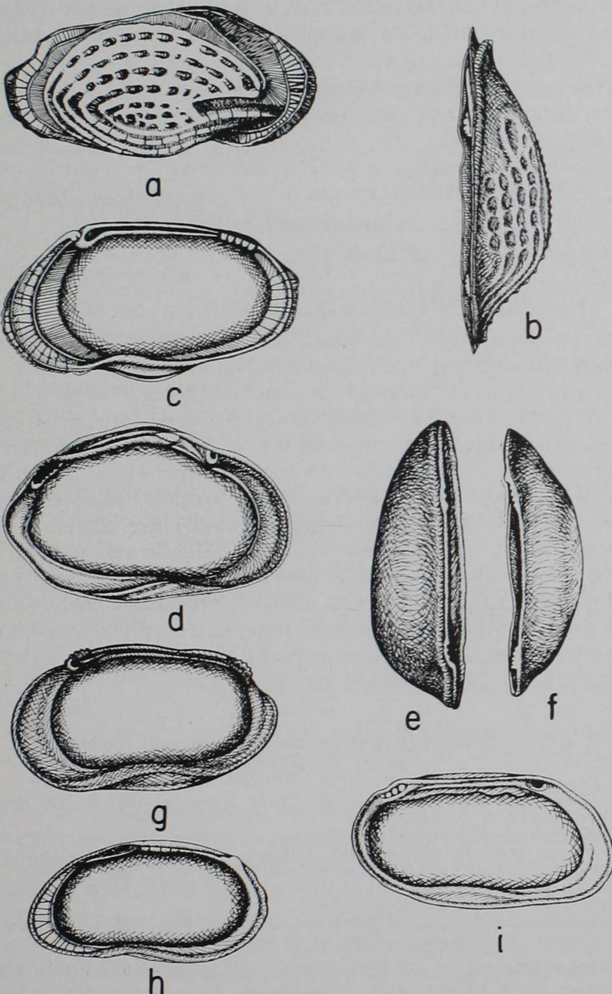
Explanation of Text Figure 7

All figures approximately X50. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b, c—*Brachycythere miocenicus* Puri, n. sp., locality no. 43. a, holotype no. 2718, a right valve; b, dorsal view of the same specimen; c, inside view of the same specimen.

d, e, f, g—*Cythere apalachicolensis* Puri, n. sp., locality no. 40. d, holotype no. 2714, a left valve; e, dorsal view of the same specimen; f, paratype no. 2715, dorsal view of a right valve; g, inside view of the same specimen.

h, i—*Cythere redbayensis* Puri, n. sp., locality no. 24. h, holotype no. 2717, a right valve; i, paratype no. 2716, a left valve.



Text Figure 7

Dimensions of holotype no. 2716, a left valve: length .811 mm.; height .439 mm.; paratype no. 2717, a right valve: length .777 mm.; height .388 mm. All of the figured specimens came from locality no. 24.

This species occurs commonly at the *Arca* facies localities nos. 24, 27, 30 and 32, and questionably at the *Ecphora* facies locality no. 38.

Subfamily TRACHYLEBERINAE Sylvester-Bradley, 1948

Genus ACTINOCYTHEREIS Puri, 1953

Actinocythereis Puri 1953a, p. 178.

Genotype: *Cythere exanthemata* Ulrich and Bassler

Carapace oblong-subquadrate. Anterior end obliquely rounded, strongly denticulate with well-developed marginal rim; posterior end obliquely rounded, denticulate, fringed with a double row of spiny tubercles. Dorsal margin broken into an irregular jagged line; ventral margin with a few spiny tubercles. Surface of the carapace ornamented with three distinct rows of vertically elongated spines. Marginal area broad, with a lipline and many paired marginal pore canals which generally are straight, sometimes are wavy, but are never thickened. Muscle scar pattern consists of four oval spots in a vertical row, a fifth is in front of the middle and a sixth is below it. Hinge of the right valve consists of an anterior tooth, a postjacent socket and a posterior tooth connected with a shallow median groove.

Range: Eocene to Miocene.

Actinocythereis exanthemata (Ulrich and Bassler)

Plate 13, figs. 6-13

Cythere exanthemata Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, p. 117, pl. 36, figs. 1-5.
Cythereis exanthemata (Ulrich and Bassler), Van den Bold, 1946, p. 88, fig. 2.
Cythereis exanthemata (Ulrich and Bassler), Swain, 1948, Maryland Dept. Geology, Mines, and Water Res. Bull. 2, p. 204, pl. 12, figs. 14, 15.
Cythereis exanthemata (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 37, pl. 6, fig. 5.
Actinocythereis exanthemata (Ulrich and Bassler), Puri, 1953a, Am. Midland Naturalist, vol. 49, pp. 179, 181, pl. 2, figs. 4-8, text figs. e, f.

Typical specimens of this species occur at the Chipola facies localities nos. 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13; Oak Grove facies locality nos. 15, 16; Shoal River facies localities nos. 17, 18; the *Arca* facies locality no. 25 and the *Ecphora* facies locality no. 42.

Figured specimens came from the Chipola facies localities nos.

1, 12; Shoal River facies locality no. 17, and *Ecphora* facies locality no. 42.

Actinocythereis exanthemata (Ulrich and Bassler) var. *gomillionensis* (Howe and Ellis)

Plate 13, figs. 16, 17

Cythereis exanthemata var. *gomillionensis* Howe and Ellis, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 19, pl. 1, figs. 6-12; pl. 4, fig. 3.
Cythereis exanthemata var. *gomillionensis* Howe and Ellis, Edwards, 1944, Jour. Paleontology, vol. 18, p. 521, pl. 87, figs. 31, 32.
Cythereis exanthemata var. *gomillionensis* Howe and Ellis, Van den Bold, 1946, p. 88, pl. 9, fig. 19.
Cythereis exanthemata var. *gomillionensis* Howe and Ellis, Van den Bold, 1950, Jour. Paleontology, vol. 24, p. 83.
Actinocythereis exanthemata var. *gomillionensis* (Howe and Ellis), Puri, 1953a, Am. Midland Naturalist, vol. 49, p. 181, pl. 2, figs. 1, 2.

Typical specimens occur at the *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; *Ecphora* facies locality no. 39 and *Cancellaria* facies localities nos. 52 and 58.

The figured specimens came from the *Cancellaria* facies localities nos. 52 and 58.

Actinocythereis exanthemata (Ulrich and Bassler) var. *marylandica* (Howe and Hough)

Plate 13, figs. 14, 15

Cythereis exanthemata var. *marylandica* Howe and Hough, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 18, pl. 1, figs. 1-5; pl. 4, fig. 7.
Actinocythereis exanthemata marylandica (Howe and Hough), Puri, 1953a, Am. Midland Naturalist, vol. 49, p. 181, pl. 2, fig. 3, text figs. c, d.

Typical specimens occur at *Arca* facies locality nos. 24, 30, 32; *Ecphora* facies localities nos. 36, 41, 42, 45 and *Cancellaria* facies locality no. 49.

The figured specimens came from the *Arca* facies locality no. 24 and *Ecphora* facies locality no. 42.

Genus ORIONINA Puri, n. gen.

Cythereis (Cythereis) Jones Skogsberg, 1928, pp. 38-56

Genotype: *Cythere vaughani* Ulrich and Bassler, 1904, p. 109, pl. 38, figs. 25-27.

Carapace large, elongate, valves unequal, left valve usually slightly larger than the right. Anterior margin evenly rounded, somewhat flattened dorsally. Surface of the carapace reticulate with two to four well-developed longitudinal ridges. Inner margin parallel to the margin of the carapace. The line of concrescence either coincides with the inner margin entirely or slightly separated from the inner margin at the anterior margin. Marginal pore canals numerous, closely set along the anterior margin and the posterior part of the ventral margin.

Hinge of the right valve with an anterior lobate tooth, a postjacent socket and a posterior terminal tooth; of the left valve with an anterior lobate tooth, an adjacent socket and a posterior socket. Between the hinge element, in the left valve, there is a well-developed ridge which fits into a corresponding furrow in the right valve.

Range: Eocene to Recent.

Named in honor of Robert Orion Vernon.

Orionina vaughani (Ulrich and Bassler)

Plate 12, figs. 15, 16; text figs. 8a-c

Cythere vaughani Ulrich and Bassler, 1904, Maryland Geol. Survey, Miocene Report, p. 109, pl. 38, figs. 25-27.
Cythereis vaughani (Ulrich and Bassler), Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 25, pl. 3, figs. 24, 25; pl. 4, fig. 13.
Cythereis vaughani (Ulrich and Bassler), Coryell and Fields, 1937, Am. Museum Novitates No. 956, p. 9, fig. 10a.
Cythereis vaughani (Ulrich and Bassler), Edwards, 1944, Jour. Paleontology, vol. 18, p. 522, pl. 87, figs. 27, 28.
Cythereis vaughani (Ulrich and Bassler), Van den Bold, 1946, p. 88, pl. 10, fig. 1.
Cythereis vaughani (Ulrich and Bassler), Van den Bold, 1950, Jour. Paleontology, vol. 20, p. 83.
Trachyleberis vaughani (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey, Prof. Paper 234-A, p. 37, pl. 6, figs. 6, 7.

Typical specimens of this species occur commonly at the Chipola facies localities nos. 1, 5; *Arca* facies localities nos. 24, 27, 30, 34; *Ecphora* facies localities nos. 37, 39, 40, 42, 43, 44, 47 and *Cancellaria* facies localities nos. 48, 49, 50, 51, 52, 53, 54, 55, 57 and 58.

The figured specimens came from the Chipola facies locality no. 1 and *Ecphora* facies localities nos. 42 and 43.

Dimensions of plesiotype no. 2793, a right valve from locality no. 1: length .676 mm.; height .287 mm.; plesiotype no. 2794, a left valve from locality no. 42: length .709 mm.; height .354 mm.; plesiotype no. 3029, a complete carapace from locality no. 43: length .709 mm.; height .338 mm.

Orionina lienenklausi (Ulrich and Bassler)

Plate 12, fig. 14; text fig. 8d

Cythere lienenklausi Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, pp. 114, 115, pl. 38, fig. 31.

This species was described from the Miocene of Maryland but typical specimens also occur at the *Ecphora* facies locality no. 42.

The figured specimen came from the *Ecphora* facies locality no. 42.

Dimensions of plesiotype no. 2792, a left valve from locality no. 42: length .625 mm.; height .338 mm.

Genus MURRAYINA Puri, n. gen.

Type genus: *Murrayina howei* Puri, n. name

Carapace elongate, ovate, dorsal and ventral margins slightly sinuous to almost straight and parallel. Both the anterior and posterior ends broadly and obliquely rounded and forming a distinct angulation with the dorsal margin. Surface of the carapace reticulate; reticulate pattern varying in the various species. Line of concrescence lies between the inner and outer margins around the anterior end. The hinge of the right valve with a smooth or slightly crenulate anterior tooth, a postjacent socket and a posterior smooth tooth connected with a serrated groove. Muscle scar pattern consisting of posteriorly located two vertical rows of three scars, with two additional oblique rows of scars located anteriorly. Marginal areas moderately wide, pore canals numerous, straight, closely spaced, sometimes occurring in bunches of two or three.

This genus resembles *Urocythereis* Ruggieri but differs from it in being broadly and obliquely rounded in both the anterior and posterior ends, having a straight hinge line; oval or oblong hinge teeth, which in the anterior are often crenulate. *Urocythereis* is shaped like an elongated *Hemicythere* with a kidney-shaped posterior tooth.

Murrayina howei Puri, n. name

Plate 12, figs. 9, 10; text figs. 8g, h

Cythere producta Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, p. 115, pl. 36, fig. 17, pl. 38, figs. 28-30 (not *Cythere producta* Brady, 1866, p. 378, pl. 59, fig. 7).

Cythereis producta (Ulrich and Bassler), Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 22, pl. 1, figs. 31, 32, 35, 37; pl. 4, figs. 11, 12.

This species was described from the Miocene of Maryland under the name *Cythere producta* and is preoccupied by *Cythere producta* Brady (1866, p. 378). The new specific name *howei* is here proposed for the Maryland species. It occurs commonly at the Chipola facies locality no. 2 and *Arca* facies localities nos. 24, 25, 28, 31 and 32.

All of the figured specimens came from the *Arca* facies locality no. 33.

Dimensions of plesiotype no. 2787, a left valve: length .878 mm.;

height .422 mm.; plesiotype no. 2788, a right valve: length .878 mm.; height .422 mm.

Murrayina gunteri (Howe and Chambers)
Plate 12, figs. 6-8; text figs. 8i, j

Cythereis gunteri Howe and Chambers, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 21, pl. 1, figs. 13-17; pl. 4, fig. 1.

This species was described from the *Arca* facies locality no. 35. It also occurs commonly at the Oak Grove facies locality no. 16; *Arca* facies localities nos. 24, 25, 28, 30, 31, 32, 33; *Ecphora* facies locality no. 40 and *Cancellaria* facies locality no. 49.

The figured specimens came from the Oak Grove facies locality no. 16 and *Arca* facies locality no. 33.

Dimensions of plesiotype no. 2784, a right valve from locality no. 33: length .845 mm.; height .456 mm.; plesiotype no. 2785, a left valve from locality no. 33: length .845 mm.; height .456 mm.; plesiotype no. 2786, a left valve locality no. 16: length .659 mm.; height .371 mm.; plestiotype no. 3028, a left valve from locality no. 16: length .659 mm.; height .371 mm.

Murrayina martini (Ulrich and Bassler)
Plate 12, figs. 11-13; text figs. 8e, f

Cythere martini Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, pp. 112, 113, pl. 36, figs. 11-15.
Cythere micula Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, p. 116, pl. 36, figs. 18-20.
Cythereis martini (Ulrich and Bassler), Swain, 1948, Maryland Dept. Geology, Mines and Water Res. Bull. 2, p. 196, pl. 12, figs. 16, 17.
Trachyleberis ? martini (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 29, pl. 3, figs. 8, 15.
Trachyleberis? cf. *T.*? *micula* (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 29, text fig. 31.

Typical specimens occur at the *Arca* facies locality no. 34, *Ecphora* facies localities nos. 37, 39, 40, 42, 43, 44, 47 and *Cancellaria* facies localities nos. 49, 51 and 52.

All the figured specimens came from the *Ecphora* facies locality no. 42.

Dimensions of plesiotype no. 2789, a right valve: length .676 mm.; height .354 mm.; plesiotype no. 2790, a left valve: length .676 mm.; height .354 mm.; plesiotype no. 2791, a right valve: length .642 mm.; height .321 mm.

Genus PURIANA Coryell and Fields, 1953

Favella Coryell and Fields, 1937, p. 8 (not *Favella* Jörgensen 1925, p. 25); Edwards, 1944, p. 523; Van den Bold, 1946, p. 32; Swain, 1951, p. 41.
Puriana Coryell and Fields, 1953, in Puri, 1953c, p. 751 (new name for *Favella* Coryell and Fields, 1937, not *Favella* Jörgensen, 1925).

Genotype: *Puriana puella* (Coryell and Fields).

Carapace subquadrate. Anterior end obliquely rounded, posterior end concave about the middle. Dorsal margin straight, ventral margin somewhat concave. Surface covered with ridges at right angles to the longitudinal axis which are more prominent in the posterior half. Marginal area broad, pore canals few, generally paired. Hinge similar to *Trachyleberis* but crenulate in young.

Range: Eocene to Recent.

Puriana puella (Coryell and Fields)

Plate 12, fig. 17

Favella puella Coryell and Fields, 1937, Am. Museum Novitates no. 956, pp. 8, 9, figs. 8a-c.

Cythereis rugipunctata gatunensis Coryell and Fields, 1937, Am. Museum Novitates no. 956, p. 10, fig. 11a.

Puriana puella (Coryell and Fields), Puri, 1953c, Jour. Paleontology, vol. 27, p. 750.

This species was described from the Gatun Miocene of Panama. Specimens referred to *Cythereis rugipunctata gatunensis* Coryell and Fields are immature molts of *Puriana puella*.

Typical specimens occur at the *Yoldia* facies locality no. 21; *Ecphora* facies localities nos. 36, 37, 38, 39, 41, 42, 43 and *Cancellaria* facies locality no. 49.

Figured specimen came from the *Ecphora* facies locality no. 42.

Dimensions of plesiotype no. 2796, a right valve from locality no. 42: length .490 mm.; height .270 mm.

Puriana rugipunctata (Ulrich and Bassler)

Plate 12, figs. 18, 19; text fig. 8k

Cythere rugipunctata Ulrich and Bassler, 1904, Maryland Geol. Surv., Miocene Report, p. 118, pl. 38, figs. 16, 17.

Cythereis rugipunctata (Ulrich and Bassler), Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 23, pl. 1, figs. 18, 20-22; pl. 4, figs. 22, 23.

Favella rugipunctata (Ulrich and Bassler), Edwards, 1944, Jour. Paleontology, vol. 18, p. 524, pl. 88, figs. 5, 6.

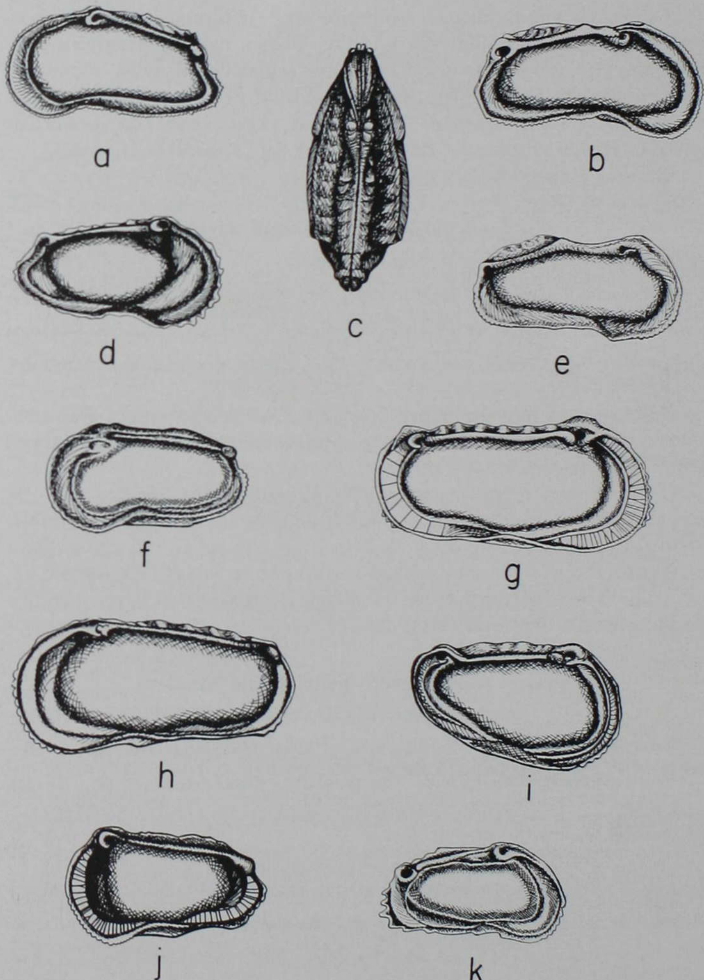
Favella rugipunctata (Ulrich and Bassler), Van den Bold, 1946, p. 100, pl. 10, fig. 3.

Favella rugipunctata (Ulrich and Bassler), Van den Bold, 1950, Jour. Paleontology, vol. 24, p. 86.

Trachyleberis? rugipunctata (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 38, pl. 6, fig. 8.

Puriana rugipunctata (Ulrich and Bassler), Puri, 1953, Jour. Paleontology, vol. 27, p. 751.

Typical specimens occur at the Shoal River facies locality no. 18; *Yoldia* facies locality no. 21; *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 32; *Ecphora* facies localities nos. 37, 38, 39, 40, 42 43, 44 and *Cancellaria* facies localities nos. 49, 51, 52 and 53.



Text Figure 8

The figured specimens came from the *Arca* facies locality no. 24 and *Ecphora* facies locality no. 42.

Dimensions of plesiotype no. 2797, a left valve from locality no. 24: length .659 mm.; height .338 mm.; plesiotype no. 2798, a left valve from locality no. 42: length .608 mm.; height .304 mm.

Genus ECHINOCYTHEREIS Puri, n. gen.

Genotype: *Cythereis garretti* Howe and McGuirt

Carapace subquadrate to subrhomboidal, subovate in side view. Anterior end broadly rounded, denticulate, with a well-developed marginal rim; posterior end obliquely rounded. Dorsal margin nearly straight, ventral margin slightly concave. Surface of the carapace ornamented with numerous small, rounded, spines roughly arranged in a concentric pattern. Marginal areas broad, marginal pore canals numerous, long and straight, more numerous at the anterior margin than at the posterior margin. Muscle scar pattern consists of four scars, in a vertical row with two additional scars situated in front and two near the ventral margin. Hinge

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Explanation of Text Figure 8

All figures approximately X50. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b, c—*Orionina vaughani* (Ulrich and Bassler). a, plesiotype no. 2795, a right valve, locality no. 42; b, plesiotype no. 2794, a left valve, locality no. 42; c, plesiotype no. 3029, dorsal view of a complete carapace, locality no. 43.

d—*Orionina lienenklausi* (Ulrich and Bassler), locality no. 42, plesiotype no. 2792, a left valve.

e, f—*Murrayina martini* (Ulrich and Bassler), locality no. 42. e, plesiotype no. 2790, a left valve; f, plesiotype no. 2789, a right valve.

g, h—*Murrayina howei* Puri, n. name, locality no. 33. g, plesiotype no. 2787, a left valve; h, plesiotype no. 2788, a right valve.

i, j—*Murrayina gunteri* (Howe and Chambers), locality no. 16. i, plesiotype no. 3028, a left valve; j, plesiotype no. 2784, a right valve.

k—*Puriana rugipunctata* (Ulrich and Bassler), locality no. 42, plesiotype no. 2798, a left valve.

in the right valve with an anterior crenulate tooth, a postjacent socket and a posterior knob-like tooth connected by a groove. Hinge of the left valve complimentary with the anterior tooth crenulate.

Range: Eocene to Recent.

Remarks: This genus is very common in the Cenozoic throughout the world and most of the earlier species have been referred to either *Cythereis* or *Cythere*. The following species are referred to this genus:

Cythereis echinata G. O. Sars
Cythere acanthoderma Brady
Cythere dasyderma Brady
Cythere erinaceous Bornemann
Cythere scabropapulosa Jones
Cythereis subcornuta Lienenklaus
Cythere hamigera Brady
Cythere arenosa Bosquet
Cythereis? okeechobiensis Swain
Cythere margaritifera Brady
Cythere nodulifera Brady
Cythere postulosa Namias
Cythere cribriformis
Cythereis jacksonensis Howe and Chambers

Further discussion of these species is not pertinent here. The writer plans to discuss this group in detail at a later date.

Echinocythereis garretti (Howe and McGuirt)

Plate 12, figs. 2-5; text figs. 9a, b

Cythereis garretti (Howe and McGuirt) in Howe et al., 1935, Florida Geol. Survey Bull. 19, p. 20, pl. 3, figs. 17-19; pl. 4, figs. 5, 15.
Buntonia? cf. *B.? garretti* (Howe and McGuirt), Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, pp. 39, 40, pl. 3, fig. 6; pl. 4, figs. 4-6.

Typical specimens occur at the *Arca* facies locality no. 34, *Ecphora* facies localities nos. 37, 38, 42, 43, 44, 45 and *Cancellaria* facies localities nos. 50 and 53.

The figured specimens came from the *Ecphora* facies localities nos. 42, 43 and 44.

Dimensions of plesiotype no. 2780, a left valve from locality no. 43: length .878 mm.; height .557 mm.; plesiotype no. 2781, a right valve from locality no. 44: length .963 mm.; height .574 mm.; plesiotype no. 2782, a right valve from locality no. 42: length .946 mm.; height .507 mm.; plesiotype no. 2783, a left valve from locality no. 42: length 1.064 mm.; height .676 mm.

Echinocythereis evax (Ulrich and Bassler)

Plate 12, fig. 1; text fig. 9c

Cythere evax Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, p. 119, pl. 36, figs. 6-8.

Cythere evax oblongula Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Report, p. 119, pl. 36, figs. 9, 10.
Cythereis evax (Ulrich and Bassler), Van den Bold, 1946, p. 90, pl. 21, fig. 19.
Cythereis evax (Ulrich and Bassler), Swain, 1948, Maryland Dept. Geology, Mines, and Water Res., Bull. 2, p. 204, pl. 12, figs. 19-20.
Trachyleberis evax (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 28, pl. 3, figs. 1-3.

Typical specimens occur at the *Ecphora* facies locality no. 42. The figured specimen also came from this locality.

Dimensions of plesiotype no. 2779, a left valve from locality no. 42: length .726 mm.; height .388 mm.

Genus PTERYGOCYTHEREIS Blake, 1933
(= *Fimbria* Neviani, 1928)

Ruggieri (1950, p. 26) says in a footnote to *Pterygocythereis* that there is a question as to whether *Fimbria* should not be the genus, but points out that someone has to determine what *Cythere fimbriata* of Münster (genotype of *Fimbria*) is. Ruggieri (op. cit.) feels that until that time the only practical way to handle this is to use *Pterygocythereis* with *Fimbria* placed in its synonymy. This procedure is followed here in this report.

Pterygocythereis cornuta americana (Ulrich and Bassler)
Plate 13, figs. 1-5; text figs. 9d-f

Cythereis cornuta var. *americana* (Ulrich and Bassler), 1904, Maryland Geol. Survey Miocene Rept., p. 122, pl. 37, figs. 29-33.
Cythereis (Pterygocythereis) cornuta var. *americana* Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 26, pl. 2, figs. 21-24; pl. 4, fig. 24.
———————— Van den Bold, 1946, p. 100, pl. 10, figs. 17a, b.

Typical specimens of this variety occur at the Chipola localities nos. 1, 12; Shoal River locality no. 17; *Arca* facies localities nos. 27, 28, 30, 31; *Ecphora* facies locality no. 36 and *Cancellaria* facies localities nos. 52, 53 and 54.

Dimensions of plesiotype no. 2799, a right valve from locality no. 12: length .760 mm.; height .388 mm.; plesiotype no. 2800, a complete carapace from locality no. 52: length .811 mm.; height .405 mm.; plesiotype no. 3016, a right valve from locality no. 17: length .777 mm.; height .405 mm.; plesiotype no. 3017, a left valve from locality no. 52: length .845 mm.; height .422 mm.; plesiotype no. 3018, a left valve from locality no. 1: length .811 mm.; height .456 mm.

Genus CATIVELLA Coryell and Fields, 1937

Cativella Coryell and Fields 1937, p. 9; Van den Bold 1946, p. 32; 1950, p. 85.
Navecythere Coryell and Fields 1937, p. 7.

Genotype: *Cativella navis* Coryell and Fields 1937, p. 9, fig. 9a

Carapace small, thickshelled, subtriangular. Anterior end broadly rounded; posterior end tuffed with marginal spines. Surface of the carapace ornamented with dorsal, ventral and anterior marginal ridges, with two well-pronounced longitudinal ridges, one below and another above the middle. The longitudinal ridges bear smaller ribs which tend to form reticulations.

Range: Miocene to Recent.

Cativella navis Coryell and Fields
Plate 11, figs. 3-7; text figs. 9i-k

Cativella navis Coryell and Fields, 1937, Am. Museum Novitates No. 956, p. 9, fig. 9.
Navecythere delicata Coryell and Fields, 1937, Am. Museum Novitates No. 956, p. 7, figs. 7a-c.
Cativella navis Coryell and Fields, Van den Bold, 1946, p. 104, pl. 12, fig. 11.
Cativella navis Coryell and Fields, Van den Bold, 1950, Jour. Paleontology, vol. 24, p. 85.

This species was originally described from the Gatun Miocene of Panama. It also occurs at the *Ecphora* facies localities nos. 36, 42, 43 and *Cancellaria* facies localities nos. 48, 50, 52, 54, 55, 57 and 58.

The figured specimens came from the *Ecphora* facies locality no. 43 and *Cancellaria* facies locality no. 50.

Explanation of Text Figure 9

All figures approximately X50. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge. La.

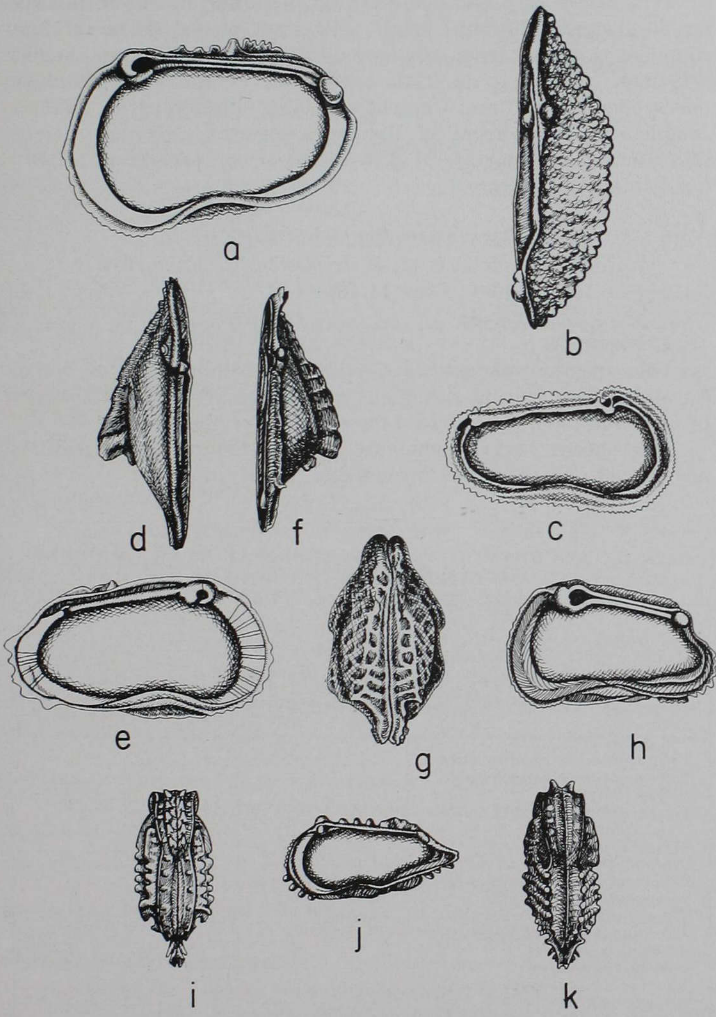
Figs. a, b—*Echinocythereis garretti* (Howe and McGuirt), locality no. 44. a, plesiotype no. 2781, a right valve; b, dorsal view of the same specimen.

c—*Echinocythereis evax* (Ulrich and Bassler), locality no. 42, plesiotype no. 2779, a left valve.

d, e, f—*Pterygocythereis cornuta americana* (Ulrich and Bassler), d, plesiotype no. 3017, a left valve from locality no. 52; e, inside view of the same specimen; f, plesiotype no. 2799, dorsal view of a right valve from locality no. 12.

g, h—*Hermania reticulata* Puri, n. gen., n. sp. g, paratype no. 2778, dorsal view of a complete carapace; h, holotype no. 2777, a right valve.

i, j, k—*Cativella navis* Coryell and Fields. i, k, plesiotype no. 2774, i, dorsal view of a complete carapace; k, ventral view of the same specimen; j, plesiotype no. 2772, a right valve from locality no. 50.



Text Figure 9

Dimensions of plesiotype no. 2772, a right valve from locality no. 50: length .540 mm.; height .253 mm.; plesiotype no. 2773, a complete carapace from locality no. 50: length .540 mm.; height .219 mm.; plesiotype no. 2774, a complete carapace from locality no. 50: length .540 mm.; height .287 mm.; plesiotype no. 2775, a complete specimen from locality no. 43: length .540 mm.; height .287 mm.; plesiotype no. 2776, a complete carapace from locality no. 43: length .473 mm.; height .219 mm.

Genus RECTOTRACHYLEBERIS Ruggieri, 1952
Rectotrachyleberis cf. *R. triplistriata* (Edwards)
Plate 11, figs. 1, 2

Cythereis triplistriata Edwards, 1944, Jour. Paleontology, vol. 18, p. 522, pl. 87, figs. 24-26.

This species was described from the Duplin marl of North Carolina. The Florida specimens are rather atypical but thought to be closer to *C. triplistriata* than any other species.

This species occurs commonly at the *Ecphora* facies localities nos. 42, 43 and the *Cancellaria* facies locality no. 57.

TABLE 4

RANGE OF SUBFAMILY TRACHYLEBERINAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Actinocythereis exanthemata	—	—	—	?	—	—	
Actinocythereis exanthemata gomillionensis					—	—	—
Actinocythereis exanthemata marylandica					—	—	—
Cativella navis						—	—
Echinocythereis garretti					—	—	—
Echinocythereis evax oblongata						—	
Echinocythereis evax						—	
Murrayina howei	—				—		
Murrayina gunteri		—			—	—	—
Murrayina martini					—	—	—
Orionina vaughani	—				—	—	—
Orionina lienenklausi						—	
Puriana rugipunctata			—	—	—	—	—
Puriana puella				—		—	—
Pterygocythereis cornuta amenicana	—		—		—	—	—
Rectotrachyleberis cf. *R. triplistriata*						—	—

Dimensions of plesiotype no. 2770, a complete carapace from locality no. 42: length .591 mm.; height .287 mm.; plesiotype no. 2771, a complete carapace from locality no. 43: length .507 mm.; height .287 mm.

Subfamily HEMICYTHERINAE Puri, 1953

Genus CAUDITES Coryell and Fields, 1937

Caudites Coryell and Fields, 1937, p. 10; Van den Bold, 1946, p. 31; Swain, 1951, p. 42; Puri, 1953, p. 176.

Genotype: *Caudites medialis* Coryell and Fields, 1937, p. 11, figs. 12a-d.

Carapace small, thick-shelled; valves compressed; elongate, subtriangular. Anterior end with thickened rim with additional longitudinal and dorsal ridges. Surface smooth or reticulate. Anterior end broadly rounded; posterior end rather drawn out. Hinge similar to *Hemicythere*.

Range: Eocene to Recent.

Caudites chipolensis Puri

Plate 11, fig. 18

Caudites chipolensis Puri, 1953, Jour. Washington Acad. Sci., vol. 43, No. 6, p. 177, pl. 2, figs. 7, 8.

This species was described from the Chipola facies. It occurs frequently at the following Chipola facies localities: 4, 6 and 12.

Caudites sellardsi (Howe and Neill)

Plate 11, fig. 17

Hemicythere sellardsi Howe and Neill, in Howe et al., 1935, Florida Geol. Survey Bull. 13, pp. 29, 30, pl. 2, figs. 6, 10.
Caudites sellardsi (Howe and Neill), Puri, 1953, Jour. Washington Acad. Sci., vol. 43, no. 6, p. 176, pl. 2, fig. 6.

This species was described from the *Arca* facies of Florida. It occurs commonly at the following *Arca* facies localities: 24, 25, 27, 28 and 30.

Genus HEMICYTHERE Sars, 1925

Hemicythere Sars, 1925, p. 182; Klie, 1929, p. 282; Tressler, 1941, p. 100; Edwards, 1944, p. 517; Van den Bold, 1946, p. 28; Puri, 1953b, pp. 172, 174.
Auris Neviani, 1928, pp. 72, 94.

Genotype (by subsequent designation by Edwards, 1944)—*Cythere villosa* Sars, 1865, p. 42.

Carapace usually almond-shaped, solid, with a semiconcave posterior dorsal margin; smooth, pitted or reticulate; valves usually unequal in size. Hinge of the right with a knob-like anterior tooth, broad postjacent socket which is continued as a strong, outwardly directed tooth at the posterior cardinal angle. Marginal area broad; inner margin and line of concrescence coincide; pore canals numerous, closely spaced, nearly straight. Muscle scar pattern consists of a vertical row of five scars with additional two to three scars situated anteriorly.

Range: Eocene to Recent.

Hemicythere amygdala Stephenson
Plate 11, fig. 14.

Hemicythere amygdala Stephenson, 1944, Jour. Paleontology, vol. 18, p. 158, pl. 28, figs. 8, 9.
Hemicythere amygdala Stephenson, Puri, 1953-b, Jour. Washington Acad. Sci. vol. 43, No. 6, p. 176, pl. 1, fig. 3.

This species was described from the subsurface *Discorbis-Heterostegina-Marginulina* zone and also occurs in the following Florida localities: Chipola facies localities nos. 1, 2, 3, 4, 5, 6, 7, 11, 13; Oak Grove facies localities nos. 15, 16 and Shoal River facies locality no. 17.

Hemicythere confragosa Edwards
Plate 11, figs. 10-12

Hemicythere confragosa Edwards, 1944, Jour. Paleontology, vol. 18, p. 518; pl. 86, figs. 23-26.
Hemicythere confragosa Edwards, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 43, pl. 6, figs. 13, 14.
Hemicythere confragosa Edwards, Puri, 1953-b, Jour. Washington Acad. Sci., vol. 43, No. 6, p. 176, pl. 1, figs. 4, 5, 6.

This species described from the Duplin Miocene of North Carolina (Edwards 1944, p. 510), also occurs in the subsurface upper Miocene of North Carolina. It occurs commonly at the *Ecphora* facies localities nos. 36, 41, 42, 43, 44, 47 and *Cancellaria* facies locality no. 47. It seems to be restricted to *Ecphora* and *Cancellaria* facies of the Choctawhatchee stage.

Hemicythere conradi Howe and McGuirt

Hemicythere conradi Howe and McGuirt, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 27, pl. 3, figs. 31-34; pl. 4, fig. 17.
Hemicythere conradi Howe and McGuirt, Edwards, 1944, Jour. Paleontology, vol. 18, p. 518, pl. 86, figs. 17-18.
Hemicythere conradi Howe and McGuirt, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, pp. 42, 43, pl. 6, figs. 9-12.
Hemicythere conradi Howe and McGuirt, Puri, 1953-b, Jour. Washington Acad. Sci., vol. 43, No. 6, p. 176, pl. 2, figs. 1, 2.

This species, described from the Choctawhatchee Miocene of Florida (Howe et al. 1935, p. 27), has also been reported from the Duplin of North Carolina and the subsurface Miocene of North

Carolina (Swain 1951, p. 43). It occurs commonly at the *Arca* facies localities nos. 24, 26, 27, 28, 29, 30; *Ecphora* facies localities nos. 36, 37, 38, 39, 40, 42, 43, 44, 47 and *Cancellaria* facies localities nos. 48, 49, 50, 52, 53, 54, 55, 57 and 58. It is confined to the Choctawhatchee Stage.

Hemicythere laevicula Edwards

Plate 11, fig. 13

Hemicythere laevicula Edwards, 1944, Jour. Paleontology, vol. 18, pp. 518, 519, pl. 86, figs. 27-30.
Hemicythere laevicula Edwards, Puri, 1953-b, Jour. Washington Acad. Sci., vol. 43, No. 6, p. 174, pl. 1, figs. 1, 2.

This species described from the Duplin Miocene of North Carolina also occurs in the *Arca* facies localities nos. 27, 30; *Ecphora* facies localities nos. 36, 41, 47 and *Cancellaria* facies locality no. 51. It is confined to the Choctawhatchee Stage.

Hemicythere howei Puri

Hemicythere howei Puri, 1953b, Jour. Washington Acad. Sci., vol. 43, No. 6, p. 176, pl. 1, figs. 7-9.

This species was described from the *Arca* and *Ecphora* facies of the Choctawhatchee Stage. It also occurs at the *Arca* facies locality no. 27 and the *Ecphora* facies locality no. 43.

Genus HERMANIA Puri, n. gen.

Type species: *Hermania reticulata* Puri, n. sp.

Carapace subquadrate, medium-sized, valves equal; ventral keel very prominent, dorsal keel fairly well-developed. Surface of the carapace reticulate; subcentral tubercle prominent. Radial pore canals numerous, long and straight. Hinge of the right valve with a smooth anterior tooth, a postjacent socket and a smooth rounded posterior tooth connected with a long, straight crenulate median groove. Left valve complimentary with both anterior and posterior elements of the hingement simple.

Range: Miocene.

Named in honor of Dr. Herman Gunter.

This genus is very close to *Bradleya* Hornibrook but differs from it in having simple elements of the hingement. *Bradleya* has a crenulate or a lobed posterior tooth in the right valve. *Bradleya* is rounded on both the anterior and posterior ends but *Hermania* has its posterior strongly compressed and produced.

Hermania reticulata Puri, n. sp.

Plate 11, figs. 8, 9; text figs. 9g, h

Carapace, subquadrate, medium sized. Both the dorsal and ventral margins almost straight. Anterior end broadly rounded; posterior end subacute, truncated and produced, tuffed with six to seven ventrally projecting spines in the ventral half of the posterior end. Surface reticulated, with two longitudinal ridges, one ventral and the other dorsal. Both of these ridges, of which the ventral is the most prominent, are more or less parallel with the dorsal and ventral margins. Both of these ridges are alate posteriorly; sloping gradually towards the anterior and merging near the rim of the anterior end. The subcentral tubercle is very prominent. Hinge normal to the genus. Other internal characters obscured by matrix.

This species resembles *Cythereis cancellata* Leinenklaus but differs in being much smaller, in having an alate dorsal ridge and its subcentral tubercle is further moved towards the anterior.

This species occurs commonly at the Chipola facies localities nos. 1, 2, 3, 9 and 13. It is restricted to the Chipola facies and its relative abundance and easily distinguishing features should prove it to be a good marker for this facies.

Dimensions of holotype no. 2777, a right valve: length .676 mm.; height .371 mm.; paratype no. 2778, a complete carapace: length .692 mm.; height .354 mm. Both the figured specimens came from the Chipola facies locality no. 1.

Genus Procythereis Skogsberg, 1928

Cythereis (Procythereis) Skogsberg, 1928, p. 17.
Procythereis Skogsberg, Puri, 1953b, p. 177.

Genotype (by original designation) *Cythereis* (*Procythereis*) *torquata* Skogsberg, 1928, p. 19.

Recent, Tierra del Fuego.

Shell a *Hemicythere* with a nearly straight dorsal margin which nearly parallels the sinuous ventral margin. Anterior end obliquely rounded; posterior angular below and above, truncated just below the middle. Surface pitted to almost reticulate, with a strong alate ridge near the ventral margin which bears a row of oblique excavations on its upper side. Hinge similar to *Hemicythere*.

Range: Miocene to Recent.

Procythereis calhounensis (Smith)

Plate 11, figs. 15, 16

Hemicythere calhounensis Smith, 1941, Amer. Assoc. Petroleum Geologists Bull., vol. 25, pp. 280, 281, pl. 1, fig. 7; pl. 2, fig. 11.

Procythereis calhounensis (Smith), Puri, 1953b, Jour. Washington Acad. Sci., vol. 43, No. 6, p. 177, pl. 2, figs. 9-11.

This species was described from the Chipola facies type locality and since has been found to be a good marker for the Chipola facies. It also occurs in the following Chipola facies localities: 1, 2, 3, 4, 5, 6, 7, 8, 9, 11 and 13.

TABLE 5

RANGE OF SUBFAMILY HEMICYTHERINAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Hemicythere confragosa Edwards						—	—
Hemicythere laevicula Edwards					—	—	—
Hemicythere howei Puri					—	—	
Hemicythere conradi Howe					—	—	—
Hemicythere amygdala Stephenson	—	—	—				
Procythereis calhounensis (Smith)	—						
Caudites sellardsi (Howei and Neill)					—		
Caudites chipolensis Puri	—						
Hermania reticulata Puri	—						

Subfamily LOXOCONCHINAE Sars, 1926

Genus LOXOCONCHA Sars, 1865

Loxoconcha anderseni Puri, n. sp.

Plate 10, fig. 4; text fig. 10c

Carapace median, elliptical in dorsal view. Dorsal margin straight; ventral margin concave in the middle. Anterior end broadly rounded below, obliquely above. Posterior end angular and produced, oblique dorsally, broadly rounded ventrally. Surface of the carapace pitted with a well-developed post-dorsal spine. Towards the anterior end, three of the ridges are fused slightly below the middle. Internal characters not observed because most of the specimens are closed carapaces.

Named for Dr. Harold V. Andersen, Louisiana State University.

Dimensions of holotype no. 2761, a complete carapace from locality no. 1: length .405 mm.; height .253 mm.

This species occurs commonly at the Chipola facies locality no. 1.

Loxoconcha alumbluffensis Puri, n. sp.

Plate 10, fig. 3; text fig. 10k

Carapace small, oval in side view. Dorsal margin almost straight, ventral margin convex in the middle. Anterior end broadly rounded; posterior end broadly rounded below, oblique above. Surface of the carapace very finely pitted. Viewed from inside, the valves are deep; marginal areas narrow; marginal pore canals few and widely spaced. Muscle scars an arcuate row of four behind a vertical row of three scars. Hinge normal to the genus.

This species is close to *L. hendryi* in shape, but differs from it in having very finely pitted test without a spine. *L. hendryi* has a well-developed median spine.

Named after Alum Bluff, Calhoun County, Florida.

Dimensions of holotype no. 2760, a left valve from locality no. 52: length .405 mm.; height .253 mm.

This species occurs frequently at the Chipola facies localities nos. 3, 13; Shoal River facies locality no. 17; the *Arca* facies locality no. 24; and the *Cancellaria* facies locality no. 52.

Loxoconcha caudata Puri, n. sp.

Plate 10, fig. 9; text fig. 10g

Carapace large, oblong in dorsal view. Dorsal margin straight, ventral margin slightly convex in the middle; posterior portion with a large ventral process. Anterior end broadly rounded; posterior end angular and compressed. Surface of the carapace ornamented with an intricate net work of ridges and pitted furrows. Dorsally these pits and furrows are roughly parallel to the dorsal margin; ventrally they are arcuate; internal details not observed due to the closed nature of the carapace.

This species could be easily identified from other pitted and reticulate forms by its large ventral process.

Dimensions of holotype no. 2766, a complete carapace from locality no. 37: length .608 mm.; height .354 mm.

This species occurs frequently at the *Ecphora* facies localities nos. 37, 41 and 43 and so far is known to occur only in the *Ecphora* facies.

Loxoconcha chipolensis Puri, n. sp.

Plate 10, fig. 12; text fig. 10f

Carapace small, oval in side view. Dorsal margin almost straight, ventral margin slightly concave in the middle. Anterior margin broadly rounded; posterior margin broadly rounded below;

obliquely above. Surface of the carapace smoothly pitted. Viewed from inside the valves are moderately deep, marginal areas broad, marginal pore canals few and widely spaced. Hinge normal to the genus.

This species could be identified easily by its oval shape and smoothly pitted surface.

Named after the Chipola River, Florida.

Dimensions of holotype no. 2769, a left valve from locality no. 12: length .540 mm.; height .338 mm.

This species frequently occurs at the Chipola facies localities nos. 4, 7, 8, 10, 11 and 12. It is restricted apparently to the Chipola facies as it was not found in any other facies.

Loxoconcha doryandae Puri, n. sp.

Plate 10, figs. 5, 6; text fig. 10d

Carapace medium, oblong in side view. Dorsal margin almost straight; ventral margin slightly concave in the middle. Anterior end broadly rounded with three blunt spines. Posterior end broadly rounded below; oblique above. Surface of the carapace closely pitted with a post-ventral ala which is fused with the margin antero-ventrally. Viewed from the side, the valves are shallow; both the anterior and posterior margins narrow, marginal pore canals not visible. Line of concrescence departs from the inner margin post-ventrally.

This species is similar to *L. wilberti* but differs in having a much coarser pit, a less sloping anterior portion and narrow marginal areas.

Named for Miss Doryand Janson who ably assisted in the preparation of the illustrations for this report.

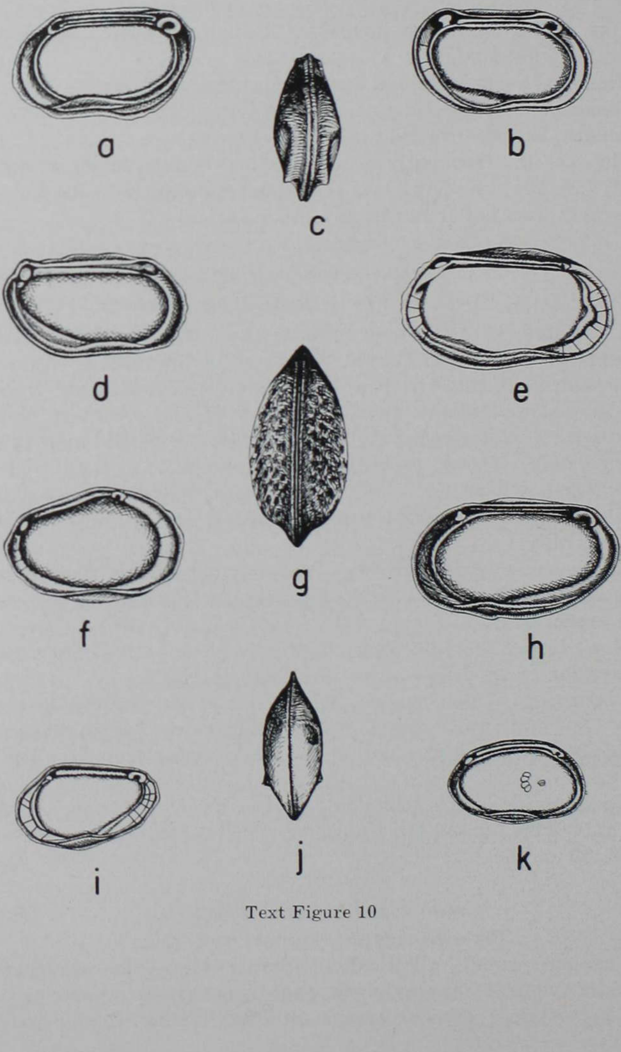
Dimensions of holotype no. 2762, a left valve: length .523 mm.; height .304 mm.; paratype no. 2763, a right valve: length .523 mm.; height .304 mm. All the figured specimens came from locality no. 52.

This species occurs commonly at the *Ecphora* facies localities nos. 37, 38, 39, 40 and the *Cancellaria* facies localities nos. 48, 50, 52, 54, 55 and 58.

Loxoconcha hendryi Puri, n. sp.

Plate 10, figs. 10, 11; text figs. 10i, j

Carapace small, elliptical in dorsal view. Dorsal margin straight, ventral margin very slightly concave. Anterior end broadly rounded, posterior margin obliquely above, broadly rounded



Text Figure 10

below. Surface of the carapace very indistinctly pitted, otherwise smooth, with a small median spine. Viewed from the inside, the valves are moderately deep, marginal areas wide, marginal pore canals few and widely spaced. Hinge normal to the genus.

This species can be easily identified by its almost smooth surface and a median spine.

Named for Charles W. Hendry, Jr., who assisted the writer in the field.

Dimensions of holotype no. 2767, a right valve from locality no. 24: length .439 mm.; height .270 mm.; paratype no. 2768, a complete carapace from locality no. 30: length .422 mm.; height .253 mm.

This species occurs commonly at the *Arca* facies localities nos. 23, 24 and 30. It should prove to be a good marker for the *Arca* facies since it was not found in any other facies.

Explanation to text figure 10

All figures approximately X50. Specimen numbers refer to Henry V. Howe Collection, Louisiana State University, Baton Rouge, La.

Figs. a, b—*Loxoconcha wilberti* Puri, n. sp., locality no. 30. a, holotype no. 2758, a right valve; b, paratype no. 2759, a left valve.

c—*Loxoconcha anderseni* Puri, n. sp., locality no. 1, holotype no. 2761, dorsal view of a complete carapace.

d—*Loxoconcha doryandae* Puri, n. sp., locality no. 52, holotype no. 2662, a left valve.

e—*Loxoconcha reticularis* Edwards, locality no. 42, plesiotype no. 2764, a left valve.

f—*Loxoconcha chipolensis* Puri, n. sp., locality no. 12, holotype no. 2769, a left valve.

g—*Loxoconcha caudata* Puri, n. sp., locality no. 37, holotype no. 2766, dorsal view of a complete carapace.

h—*Loxoconcha purisubrhomboidea* Edwards, locality no. 44, plesiotype no. 2765, a right valve.

i, j—*Loxoconcha hendryi* Puri, n. sp. i, holotype no. 2767, a right valve from locality no. 24; j, paratype no. 2768, dorsal view of a complete carapace, locality no. 30.

k—*Loxoconcha alumbluffensis* Puri, n. sp., locality no. 52, holotype no. 2760, a left valve.

Loxoconcha purisubrhomboidea Edwards

Plate 10, fig. 8; text fig. 10h

Loxoconcha subrhomboidea Edwards, 1944 (not Brady 1880), Jour. Paleontology, vol. 18, pp. 527, 528, pl. 88, figs. 28-32.

———— Edwards, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, pp. 25, 26, pl. 2, figs. 18, 19.

Loxoconcha purisubrhomboidea Edwards, n. name in Puri, 1953c, Jour. Paleontology, vol. 27, p. 750.

This species was described from the Duplin marl of North Carolina (Edwards 1944, p. 527) and has been reported from the upper Miocene (Yorktown) of Virginia and the lower and middle Miocene of North Carolina (Swain 1951, pp. 25, 26).

Typical members of this species commonly occur at *Ecphora* facies localities nos. 36, 37, 41, 42, 43, 44 and *Cancellaria* facies localities nos. 48, 52, 53, 54, 55, 57, 58.

Dimensions of plesiotype no. 2765, a right valve: length .659 mm.; height .405 mm. The figured specimen came from the *Ecphora* facies locality no. 44.

Loxoconcha reticularis Edwards

Plate 10, fig. 7; text fig. 10e

Loxoconcha reticularis Edwards, 1944, Jour. Paleontology, vol. 18, p. 527, pl. 88, figs. 26, 27.

Loxoconcha cf. *L. reticularis* Edwards, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 26.

This species was described from the Duplin marl of North Carolina (Edwards 1944, p. 527) and has been reported from the subsurface upper Miocene of North Carolina (Swain 1951, p. 26).

This species occurs commonly at the *Ecphora* facies localities nos. 36, 37, 38, 39, 40, 41, 42, 43 and *Cancellaria* facies localities nos. 48, 52, 53, 54, 55, 57, 58.

Dimensions of plesiotype no. 2764, a left valve from locality no. 42: length .692 mm.; height .388 mm.

Loxoconcha wilberti Puri, n. sp.

Plate 10, figs. 1, 2; text figs. 10a, b

Carapace median; oblong. Dorsal margin straight; ventral margin slightly concave in the middle. Anterior end broadly rounded; posterior end obliquely rounded ventrally, oblique dorsally. Surface of the carapace reticulate with a well-developed post ventral spine. Viewed from inside the valves are moderately deep; both anterior and posterior margins wide; marginal pore canals few, widely spaced.

This species could be easily identified from other reticulate species by its post ventral spine.

Named in honor and in memory of Dr. Louis J. Wilbert.

Dimensions of holotype no. 2758, a right valve: length .625 mm.; height .338 mm.; paratype no. 2759, a left valve: length .659 mm.; height .321 mm. All the figured specimens came from locality no. 30.

This species occurs frequently at the *Arca* facies locality no. 30; the *Ecphora* facies locality no. 43; and *Cancellaria* facies localities nos. 52, 53 and 55.

TABLE 6

RANGE OF THE GENUS LOXOCONCHA IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Loxoconcha anderseni	X						
Loxoconcha chipolensis	X						
Loxoconcha alumbluffensis	X		X		X		X
Loxoconcha hendryi					X		
Loxoconcha caudata						X	
Loxoconcha doryandae						X	X
Loxoconcha purisubrhomboidea						X	X
Loxoconcha reticularis						X	X
Loxoconcha wilberti					X	X	X

Genus CYTHEROMORPHA Hirschmann, 1909

Cytheromorpha dalli (Howe and Brown)

Plate 6, fig. 8; text fig. 11h

Hemicythere dalli Howe and Brown, in Howe et al., 1935, Florida Geol. Survey Bull. 13, pp. 28, 29, pl. 2, figs. 1-3; pl. 4, fig. 18.

Hemicythere dalli Howe and Brown, Smith, 1941, Amer. Assoc. Petroleum Geologists, Bull., vol. 25, p. 279.

This species occurs commonly at Oak Grove facies locality no. 16 and Shoal River facies locality no. 18.

Dimensions of plesiotype no. 2745, a left valve from locality no. 16: length .708 mm.; height .338 mm.

Cytheromorpha laevigata Puri, n. sp.

Plate 6, figs. 3, 4; text figs. 11a, b

Carapace thin, fragile, elongate, length-breadth ratio more than two to one. Dorsal margin almost straight; ventral margin slightly concave in the middle. Both anterior and posterior margins broadly rounded. Surface of the carapace smooth, with a prominent sulcus slightly anterior to the middle. Viewed from inside, the valves are deep; anterior margin wider than the posterior margin; marginal pore canals few and widely spaced. Hinge normal to the genus.

This species resembles *C. warneri* in its shape but it differs from it by its smooth carapace.

This species occurs commonly at the *Arca* facies localities nos. 24, 30 and 32.

Dimensions of the holotype no. 2746, a left valve: length .659 mm.; height .321 mm.; paratype no. 2747, a right valve: length .642 mm.; height .287 mm. Both of the figured specimens came from the *Arca* facies locality no. 32.

Cytheromorpha redbayensis Howe and Brown

Hemicythere dalli var. *redbayensis* Howe and Brown, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 29, pl. 2, figs. 4, 7.

This species occurs only at the *Arca* facies locality no. 34. It has not been observed at any other locality. It should prove to be a good marker for the *Arca* facies.

Cytheromorpha subminuta Puri, n. sp.

Plate 6, figs. 9, 10; text figs. 11i, j

Carapace small, elongate. Dorsal margin almost straight, ventral margin concave in the middle. Anterior end broadly rounded; posterior end compressed and denticulate with four spines. Surface of the carapace ornamented with two round ridges, one around the anterior central tubercle; the other around the posterior central tubercle. Viewed from inside, the valves are shallow; marginal areas are wide. Hinge in the left valve with an anterior socket behind which is a circular tooth; a posterior socket and a connecting bar. Hinge of right valve complimentary.

This species differs from *C. redbayensis* in having circular ridges around two anterior and posterior tubercles; each occupying nearly half of the carapace.

This species occurs commonly at the *Arca* facies localities nos. 24, 27, 28, 30; the *Ecphora* facies localities nos. 39, 43, 44; and the *Cancellaria* facies localities nos. 48, 50, 53, 54, 55 and 58.

Dimensions of holotype no. 2751, a left valve: length .354 mm.; height .202 mm.; paratype no. 2752, a complete carapace: length .371 mm.; height .202 mm. All figured specimens came from the *Ecphora* facies locality no. 43.

Cytheromorpha warneri Howe and Spurgeon

Plate 6, figs. 5, 6, 7; text figs. 11f, g

Cytheromorpha warneri Howe and Spurgeon, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 11, pl. 2, figs. 5, 8, 9; pl. 4, fig. 4.

———— Van den Bold, 1946, p. 105.

———— Van den Bold, 1950, Jour. Paleontology, vol. 24, p. 86.

Cytheromorpha cf. *C. warneri* Howe and Spurgeon, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 49, pl. 7, figs. 18, 19.

This species was described from the Choctawhatchee Miocene of Florida (Howe, et al., 1935, p. 11) and has been reported from the Miocene of the Caribbean region (Van den Bold 1946, p. 105), Miocene of Venezuela (Van den Bold 1951, p. 86) and the subsurface upper Miocene of North Carolina (Swain 1951, p. 49).

This species occurs frequently at the *Ecphora* facies localities nos. 36, 37, 38, 39, 40, 41, 42, 43 and *Cancellaria* facies localities nos. 48, 49, 53, 54, 57, 58.

Dimensions of plesiotype no. 2748, a right valve: length .540 mm.; height .304 mm.; plesiotype no. 2749, a left valve: length .608 mm., height .287 mm.; plesiotype no. 2750, a right valve: length .523 mm.; height .270 mm. All of the figured specimens came from the *Ecphora* facies locality no. 42.

Cytheromorpha warneri okaloosensis Puri, n. var.

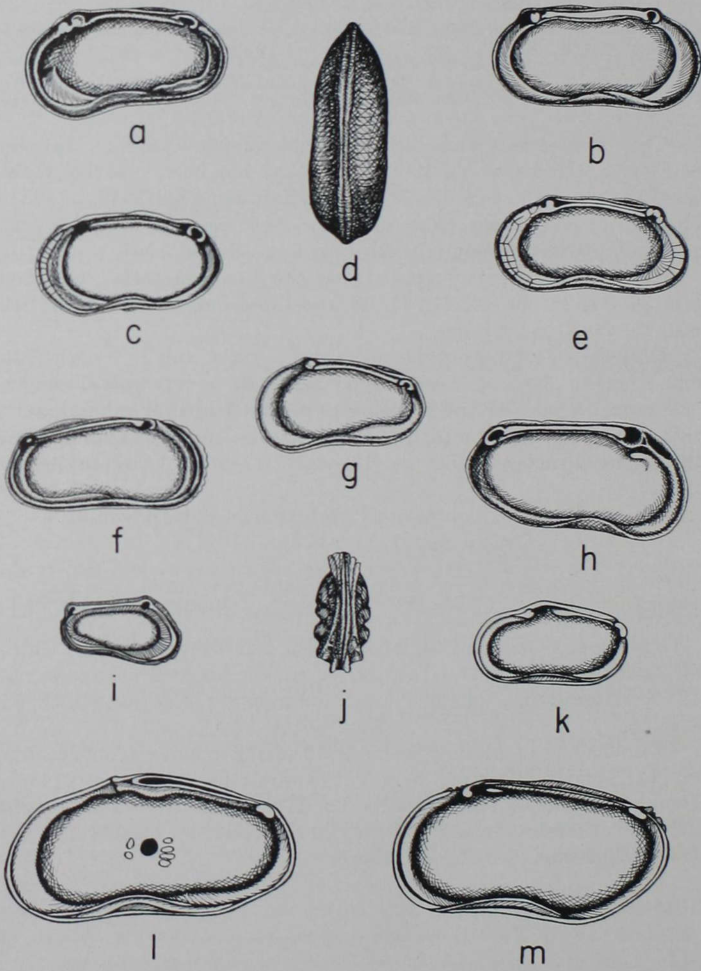
Plate 6, figs. 1, 2; text figs. 11c, d, e

Cytheromorpha warneri okaloosensis Howe and Spurgeon, in Howe et al., 1935, Florida Geol. Survey Bull. 13, pp. 12, 13 (*nom. nud.*).

———— Smith, 1941, Am. Assoc. Petroleum Geologists Bull., vol. 25, p. 279 (*nom. nud.*).

This species occurs frequently at the following localities: Chipola facies nos. 4, 6; Oak Grove facies no. 16; Shoal River facies no. 17; *Arca* facies nos. 24, 25, 27, 30; *Cancellaria* facies nos. 50, 52, 55 and 58.

Dimensions of plesiotype no. 2719, a right valve from locality no. 17: length .591 mm.; height .270 mm.; plesiotype no. 2743, a complete carapace from locality no. 17: length .676 mm.; height .321 mm.; plesiotype no. 2744, a right valve from locality no. 16: length .608 mm.; height .270 mm.



Text Figure 11

TABLE 7

RANGE OF THE GENUS CYTHEROMORPHA IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Cytheromorpha warneri okaloosensis	—	—			—		—
Cytheromorpha dalli		—	—				
Cytheromorpha laevigata					—		
Cytheromorpha redbayensis					—		
Cytheromorpha subminuta					—	—	—
Cytheromorpha warneri						—	—

Explanation of text figure 11

All figures approximately X50. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b—*Cytheromorpha laevigata* Puri, n. sp., locality no. 32. a, paratype no. 2747, a right valve; b, holotype no. 2746, a left valve.

c, d, e—*Cytheromorpha warneri okaloosensis* Howe and Spurgeon. c, paratype no. 2719, a right valve from locality no. 17; d, paratype no. 2743, a complete carapace from locality no. 17; e, paratype no. 2744, a right valve from locality no. 16.

f, g—*Cytheromorpha warneri* Howe and Spurgeon, locality no. 42. f, plesiotype no. 2749, a left valve; g, plesiotype no. 2750, a right valve.

h—*Cytheromorpha dalli* (Howe and Brown), plesiotype no. 2745, a left valve.

i, j—*Cytheromorpha subminuta* Puri, n. sp., locality no. 43. i, holotype no. 2751, a left valve; j, paratype no. 2752, a complete carapace.

k—*Basslerites miocenicus* (Howe), locality no. 42, plesiotype no. 2753, a right valve.

l—*Basslerites* cf. *B. giganticus* Edwards, locality no. 42, plesiotype no. 2755, a right valve.

m—*Basslerites tenmilecreekensis* Puri, n. sp., locality no. 12, paratype no. 2756, a right valve.

Subfamily CYTHERETTINAE Triebel, 1952

Genus BASSLERITES Howe, 1937

Basslerella Howe, 1935, p. 30.
Basslerites Howe, in Coryell and Fields, 1937, p. 11; Ruggieri, 1952, p. 42.

Genotype—*Basslerella miocenica* Howe, 1935

Basslerites cf. *B. giganticus* Edwards

Plate 8, fig. 12; text fig. 11L

Basslerites giganticus Edwards, 1944, Jour. Paleontology, vol. 18, p. 521, pl. 87, figs. 19-23.

This species was described from the Duplin marl of North Carolina and also occurs at the *Arca* facies locality no. 30; *Ecphora* facies localities nos. 36, 41, 44, 45, 47; and the *Cancellaria* facies localities nos. 48, 50, 52, 54, 55 and 57.

Dimensions of the plesiotype no. 2755, a right valve from locality no. 42: length .878 mm.; height .456 mm.

Basslerites miocenicus (Howe)

Plate 8, figs. 10, 11; text fig. 11k

Basslerella miocenica Howe, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 31, pl. 1, figs. 19, 24, 26.
Basslerites miocenicus Howe, in Coryell and Fields, 1937, Am. Mus. Novitates No. 956, p. 12, figs. 13a, b.
———— Van den Bold, 1946, p. 106 (not pl. 12, fig. 5, according to Van den Bold).
———— Van den Bold, 1950, Jour. Paleontology, vol. 24, p. 85.

This species was described from the Choctawhatchee Miocene. It also occurs at the *Arca* facies localities nos. 24, 27, 30; *Ecphora* facies localities nos. 36, 37, 38, 39, 41, 42, 43, 47; *Cancellaria* facies localities nos. 48, 50, 52, 53, 54, 57, 58.

Dimensions plesiotype no. 2753, a right valve: length .473 mm.; height .236 mm.; plesiotype no. 2754, a right valve: length .439 mm.; height .219 mm. Both the figured specimens came from the *Ecphora* facies locality no. 42.

Basslerites tenmilecreekensis Puri, n. sp.

Plate 8, figs. 13-15; text fig. 11m

Carapace large, thick, oblong. Dorsal margin gently arched; ventral margin slightly concave in front of the middle. Anterior end broadly rounded below, oblique above; posterior end slightly produced, broadly rounded in the upper half, oblique in the lower half. Surface of the carapace pitted with normal pore canals, otherwise smooth. Viewed from inside, the valves are moderately deep. Both the anterior and the posterior margins small, radial pore canals not visible because of the thickness of the carapace. Hinge in the right valve with an oval anterior tooth, a postjacent socket and an oblong posterior tooth connected by a joint groove. Muscle scar pattern indistinct.

This species resembles *B. giganticus* Edwards in its size and general outline but is less oblique in the upper half of the anterior margin; both the anterior and posterior margins are reduced; the anterior and posterior elements of hingement are further apart, and the connecting elements are straight and not curved as is the case with *B. giganticus.*

Named after the Tenmile Creek, Calhoun County, Florida.

Dimensions of holotype no. 2756, a right valve: length .878 mm.; height .422 mm.; paratype no. 2757, a right valve: length .743 mm.; height .354 mm.

This species occurs commonly at the Chipola facies localities nos. 1, 3, 5, 7, 8, 10, 11, 12 and questionably at the *Arca* facies locality no. 28.

Genus CYTHERETTA G. M. Müller, 1894

Cytheretta Müller, 1894, p. 382; 1912, p. 366; Edwards, 1944, p. 524; Van den Bold, 1946, p. 27; Puri, 1952a, p. 202; Triebel, 1952, pp. 16-18.
Pseudocytheretta Cushman, 1906, p. 382.
Cylindrus Neviani, 1928, pp. 106, 107.
Prionocytheretta Méhes, 1941, p. 60.

Genotype—Cytheretta rubra Müller 1894, p. 382, pl. 8, figs. 9, 10, 13, 16; pl. 39, figs. 8-22, 24.

Carapace elongate ovate, left valve larger than right, differently shaped, over-lapping right valve at cardinal angles and just anterior to middle of ventral margin. Anterior broadly rounded. Posteroventral margin curves upward with posterior extremity at or above middle. Surface smooth, pitted or ribbed. Hinge of right valve with anterior tooth, postjacent socket and a posterior tooth with dorsal margin grooved in between. Hinge of left valve with deep rounded anterior socket, long bar-like tooth, widest and highest anteriorly, middle portion grooved and narrower, terminated abruptly by deep, oval, posterior socket. Marginal area very broad and irregular. Line of concrescence coinciding with inner margin and forming S-shaped curve in anteroventral regions. Radial pore canals rather numerous, thin, curved, closely spaced, frequently crossing, often slightly thickened in middle. Muscle scar pattern consisting of a row of four elongate scars centrally located and an anterior heartshaped scar. Range: Eocene to Recent.

The Miocene species of the Gulf Coastal Plain may be divided into four closely related groups. In the first the surface is essentially smooth but sometimes shows faint pits, as in *C. ulrichi.* In the second, at least the central portion of the carapace shows strong, longitudinally arranged pits as in *C. burnsi.* The third group possesses longitudinal ridges similar to *Paracytheretta* but the actual surface is smooth, polished and almost porcellanous in appearance. The earliest member of the last group is *C. okaloosensis* which appears in the Chipola and the type Oak Grove of Florida. It is much smaller and much less triangular than *C. inaequivalvis,* which appears to characterize the Shoal River Miocene of Florida and is more triangular than any other member of this group. *C. bassleri* is the largest species of the group and possesses the most subdued ornamentation. It is restricted to the *Arca* facies of the Choctawhatchee Miocene of Florida. *C. sahnii,* which occurs in the *Ecphora* and *Cancellaria* facies of the upper Miocene Duplin formation of Florida, is very similar to *C. bassleri* but is more elongate, particularly in the right valve, and possesses a much greater number of minute ribs in the ventral half. The fourth group is reticulate with three longitudinal ribs. This group is represented by four species: *C. choctawhatcheensis, C. karlana, C. gardneri* and *C. calhounensis.*

Cytheretta bassleri Howe
Plate 8, figs. 5, 6

Cytheretta bassleri Howe, Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 32, pl. 3, figs. 21, 22.
Cytheretta cf. *C. bassleri* Howe, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 46.
Cytheretta bassleri Puri, 1952a, Jour. Paleontology, vol. 26, p. 208, pl. 39, figs. 10, 11.

This species was described from the *Arca* facies of the middle Miocene of the Choctawhatchee Stage. It is present at the *Arca* facies localities nos. 24, 25, 27, 29 and 30.

The figured specimens came from locality no. 24.

Cytheretta burnsi (Ulrich and Bassler)
Plate 7, figs. 1, 2

Cythere burnsi Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Rept., p. 103, pl. 36, figs. 34-39.
Cythere nitidula Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Rept., pp. 107, 108, pl. 36, figs. 21-23.
Cytheretta burnsi Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 33, pl. 2, figs. 12-14, 17, 20; pl. 4, figs. 14, 21.
Cutheretta burnsi Puri, 1952a, Jour. Paleontology, vol. 26, pp. 205, 206, pl. 39, figs 5, 6.

This species, described from the Calvert Miocene of Maryland, is present in the *Arca* facies of the Choctawhatchee Stage at localities nos. 26, 28 and 30; *Ecphora* facies localities nos. 20, 38 and 41; *Cancellaria* facies localities nos. 53 and 55.

Cytheretta calhounensis Smith
Plate 7, figs. 8, 9

Cytheretta calhounensis Smith, 1941, Bull. Amer. Assoc. Petroleum Geologists, vol. 25, p. 283, pl. 1, figs. 12, 13; pl. 2, figs. 2, 15.
Paracytheretta calhounensis Puri, 1952a, Jour. Paleontology, vol. 26, p. 211, pl. 40, figs. 12-14; text figs. 9-10.

This species was described from the Chipola facies and seems to be restricted to it. It is found commonly at Chipola facies localities nos. 1, 2, 3, 4, 5, 6, 7, 8, 12 and 13.

Cytheretta choctawhatcheensis Howe and Taylor
Plate 7, figs. 10, 11

Cytheretta karlana choctawhatcheensis Howe and Taylor, Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 35, pl. 1, figs. 28, 29, 33.
Cytheretta karlana choctawhatcheensis Van den Bold, 1946, p. 106, pl. 10, figs. 24a-d.
Paracytheretta choctawhatcheensis Puri, 1952a, Jour. Paleontology, vol. 26, p. 210, pl. 40, figs. 8, 9.

This species was described originally from the *Arca* facies of the Choctawhatchee Stage. It has since been reported from the Chipola Miocene and questionable from the *Ecphora* and *Cancellaria* facies of the Choctawhatchee Stage (Puri 1952a, p. 210). It occurs commonly at the Chipola facies locality no. 1 and the *Arca* facies locality no. 30. It is also questionably present in the *Ecphora* facies localities nos. 35, 39, 40, 41 and the *Cancellaria* facies locality no. 52.

Cytheretta dalli Smith
Plate 8, figs. 1, 2

Cytheretta dalli Smith, 1941, Amer. Assoc. Petroleum Geologists Bull., vol. 25, p. 282, pl. 1, figs. 2, 6, 8; pl. 2, figs. 3, 7, 13.
Cytheretta dalli Smith, Puri, 1952a, Jour. Paleontology, vol. 26, p. 208, pl. 39, figs. 12, 13.

This species was described originally from the type Oak Grove facies at locality no. 15. So far as known, it has not been reported from any other horizon. Smith's cotypes nos. 2861 and 2863 are refigured.

Cytheretta gardneri Smith
Plate 7, figs. 3, 4

Cytheretta gardneri Smith, 1941, Amer. Assoc. Petroleum Geologists Bull., vol. 25, pp. 281, 282, pl. 1, figs. 4, 5; pl. 2, figs. 16, 17.
Paracytheretta gardneri Puri, 1952a, Jour. Paleontology, vol. 26, p. 209, pl. 4, figs. 1, 2.

This species is a good marker for the middle Miocene Oak Grove facies and occurs rarely at locality no. 16.

Cytheretta inaequivalvis (Ulrich and Bassler)

Plate 8, fig. 9

Cythere inaequivalvis Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Rept., pp. 101, 102, pl. 35, figs. 15-17.
Cytheretta inaequivalvis Swain, 1948, Bull. State of Maryland, Cret. and Tert. Subsurface Rept., p. 213, pl. 13, fig. 5.
Cytheretta inaequivalvis (Ulrich and Bassler), Swain, 1951, U. S. Geol. Survey, Prof. Paper 234-A, p. 46.
Cytheretta inaequivalvis Puri, 1952a, Jour. Paleontology, vol. 26, pp. 207, 208, pl. 39, fig. 9.

This species was described originally from the Calvert Miocene of Maryland and has since been reported from the Florida Miocene (Puri 1952, pp. 207, 208).

The figured specimens came from the Shoal River locality no. 17.

Cytheretta karlana Howe and Pyeatt

Plate 7, figs. 5, 6

Cytheretta karlana Howe and Pyeatt, Howe et al., 1935, Florida Geol. Survey Bull. 13, pp. 34, 35, pl. 1, figs. 30, 34; pl. 3, figs. 3, 4.
Cytheretta karlana Smith, 1941, Amer. Assoc. Pet. Geol. Bull., vol. 25, p. 279.
Cytheretta karlana Van den Bold, 1946, p. 106, pl. 19, fig. 18.
Cytheretta karlana Howe and Pyeatt, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 46, pl. 6, fig. 19.
Paracytheretta karlana Puri, 1952a, Jour. Paleontology, vol. 26, p. 209, pl. 40, figs. 3-5; text fig. 8.

This species was described originally from the Chipola Miocene, locality no. 11. It has since been reported from the Oak Grove and the Shoal River (Puri, 1952a, p. 209).

This species is common in the Chipola Miocene where it occurs at localities 1, 3, 4, 6, 7, 9, 10, 11 and 12. It was also found at the Oak Grove facies locality no. 16 and the Shoal River facies locality no. 17.

Cytheretta okaloosensis Smith

Plate 8, figs. 3, 4

Cytheretta okaloosensis Smith, 1941, Am. Assoc. Petroleum Geologists Bull., vol. 25, p. 283, pl. 1, figs. 1, 3, 9, 10, 16; pl. 2, figs. 1, 7, 9, 11, 14.
Cytheretta okaloosensis Puri, 1952a Jour. Paleontology, vol. 26, p. 208, pl. 39, figs. 14, 15.

This species was described originally from the type Oak Grove locality no. 15. It has also been reported from the Chipola facies. Smith's cotypes nos. 2870 and 2871 are refigured.

Dimensions of cotype no. 2870, a left valve: length .950 mm.; height .450 mm.; cotype no. 2871, a right valve: length .870 mm.; height .460 mm.

Cytheretta sahnii Puri

Plate 8, figs. 7, 8

Cytheretta sahnii Puri, 1952a, Jour. Paleontology, vol. 26, pp. 206, 207, pl. 39, figs. 7, 8; text figs. 1, 2.

This species was described originally from the *Ecphora* facies of the Choctawhatchee Stage and has also been found at the *Ecphora* facies localities nos. 38, 41, 42 and 43, and *Cancellaria* facies localities nos. 48, 50, 52, 55, 57 and 58.

Cytheretta spencerensis Smith
Plate 7, fig. 7

Cytheretta spencerensis Smith, 1941, Amer. Assoc. Petroleum Geologists Bull., vol. 25, pp. 282, 283, pl. 1, figs. 4, 5, 6, 8.
Cytheretta spencerensis Puri, 1952a, Jour. Paleontology, vol. 26, p. 205, pl. 39, fig. 4.

This species was described originally from the *Yoldia* facies of the Choctawhatchee Stage. It is a good marker for this facies and the upper part of the Shoal River facies. Smith's cotype no. 2872, a left valve is refigured.

TABLE 8

RANGE OF THE GENUS CYTHERETTA IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Cytheretta sahnii						—	—
Cytheretta bassleri					—		
Cytheretta burnsi					—	—	—
Cytheretta choctawhatcheensis	—				—	····	····
Cytheretta karlana	—	—	—				
Cytheretta inaequivalvis			—				
Cytheretta spencerensis			—	—			
Cytheretta dalli		—					
Cytheretta gardneri		—					
Cytheretta calhounensis	—						
Cytheretta okaloosensis	—	—					

Subfamily CYTHERIDEIDINAE Puri, 1952
Genus CYTHERIDEIS Jones, 1857

Cytherideis Jones 1857, p. 46 (as a subgenus of *Cythere*) pars; Brady, 1866, p. 366 pars; Brady, 1868 (Int. Obs.), p. 125; Brady, 1868 (monograph), p. 454; Brady and Robertson, 1872, p. 58, 59; Reuss, 1874, p. 149; Brady, 1878, p. 405; Brady, 1880 ("Challenger" Report), p. 146; Brady and Norman, 1889, p. 226; Müller, 1894, p. 380; Lienenklaus, 1900, p. 535; Cushman, 1906, p. 381; Müller, 1912, p. 367; Neviani, 1928, p. 108; Van Veen, 1936, p. 37; Edwards, 1944, p. 514; Van den Bold, 1946, p. 27; Puri, 1952b, p. 906.
Hemicytherideis Ruggieri, 1952, p. 60.

Genotype: *Cytherideis botellina* (Jones)

Elongate, cylindrical or tapering, approximately three to one;

both ends rounded, anterior more so; left valve larger than the right and overlapping it dorsally and ventrally; surface smooth, perforate, tuberculate or papillate, marginal area broadest at the anterior where the line of concrescence does not coincide; radial pore canals few to moderately numerous, sometimes bifurcating. Muscle-scar pattern consists of a vertical row of four behind an additional three scars arranged in an arcuate manner. Hinge with a flange in the left valve which forms a furrow into which the dorsal margin of the right valve articulates. The furrow opens usually toward the anterior.

Range: Jurassic to Recent.

Cytherideis agricola Howe and Hadley
Plate 9, figs. 1-3

Cytherideis agricola Howe and Hadley, in Howe et al., Florida Geol. Survey Bull. 13, p. 13, pl. 3, figs. 27-30; pl. 4, fig. 8.
Cytherideis agricola Howe and Hadley, Puri, 1952b, Jour. Paleontology, vol. 26, pp. 910-911, pl. 130, figs. 1-3; text fig. 11.

Typical specimens of this species occur at the Oak Grove facies localities nos. 15, 16; the Shoal River facies locality no. 17; the *Arca* facies localities nos. 24, 26, 27, 28, 30; the *Ecphora* facies localities nos. 36, 37, 38, 39, 40; and the *Cancellaria* facies localities nos. 51 and 52. It also occurs questionably at Chipola facies locality no. 5.

Cytherideis anderseni Puri
Plate 9, figs. 15-17

Cytherideis anderseni Puri, 1952b, Jour. Paleontology, vol. 26, p. 908, pl. 130, figs. 15-17; text figs. 9-10.

This species was described from the Chipola facies localities nos. 1. 10; the *Arca* facies locality no. 24. It occurs commonly at Chipola facies localities nos. 3, 6, 7, 9, 11 and the *Arca* facies localities nos. 25, 28, 30.

Cytherideis ashermani Ulrich and Bassler
Plate 9, figs. 4-8

Cytherideis ashermani Ulrich and Bassler, 1904, Maryland Geol. Survey Miocene Rept., p. 126, pl. 37, figs. 10-16.
Cytherideis longula Ulrich and Bassler, 1904, Maryland Geol. Survey, Miocene Rept., p. 128, pl. 37, figs. 21-27.
Cytherideis semicircularis Ulrich and Bassler, 1904, Maryland Geol. Survey, Miocene Rept., p. 127, pl. 37, figs. 18-20.
Cytherideis ashermani Ulrich and Bassler, Howe et al., 1935, Florida Geol. Survey, Bull. 13, p. 14, pl. 3, figs. 8-10.
Cytherideis ashermani Ulrich and Bassler, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 19.
Cytherideis ashermani Ulrich and Bassler, Puri, 1952b, Jour. Paleontology, vol. 26, p. 910, pl. 130, figs. 4-8; text figs. 1-2.

Typical specimens of this species occur at Chipola facies localities nos. 1, 2, 3, 4, 6, 7, 11, 12; the Oak Grove facies localities nos. 15, 16; Shoal River facies localities nos. 17, 18; *Arca* facies localities nos. 23, 24, 25, 26, 27, 29, 30, 31; the *Ecphora* facies localities nos. 36, 37, 38, 39, 40, 41, 42; and the *Cancellaria* facies localities nos. 49 and 51.

Cytherideis fabula Howe and Dohm
Plate 9, fig. 14

Cytherideis fabula Howe and Dohm, in Howe et al., 1935, Florida Geol. Survey Bull. 13, p. 15, pl. 3, figs. 15, 16, 20, 23; pl. 4, fig. 2.
Cytherideia fabula Howe and Dohm, Puri, 1952b, Jour. Paleontology, vol. 26, pp. 911-912, pl. 130, fig. 14; text figs. 3-4.

Typical specimens of this species occur at the Chipola facies localities nos. 4, 6, 7, 10, 12; Oak Grove facies nocality no. 15, Shoal River facies localities nos. 17, 18; *Yoldia* facies locality No. 21; *Arca* facies localities nos. 24, 25, 26, 27, 28, 30, 31; *Ecphora* facies localities nos. 42, 43, 44; and *Cancellaria* facies localities nos. 49 and 51.

Cytherideis ulrichi Howe and Johnson
Plate 9, figs. 11-13.

Cytherideis ulrichi Howe and Johnson, in Howe et al., 1935, Florida Geol. Survey, Bull. 13, p. 16, pl. 3, figs. 11-14.
Cytherideis ulrichi Howe and Johnson, Puri, 1952b, Jour. Paleontology, vol. 26, p. 911, pl. 130, figs. 11-13; text figs. 5, 6.

Typical members of this species occur at Chipola facies localities nos. 5, 12; Oak Grove facies localities nos. 15, 16; *Arca* facies localities nos. 25, 26, 27, 28, 30.

TABLE 9

RANGE OF THE GENUS CYTHERIDEIS IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Cytherideis rugipustulosa						———	———
Cytherideis agricola	———	———	———	·····	———	———	———
Cytherideis fabula	———	———	———	———	———	———	———
Cytherideis ulrichi	———	———	·····	·····	———		
Cytherideis ashermani	———	———	———	·····	———	———	———
Cytherideis anderseni	———	·····	·····	·····	———		
Cytherideis wilberti	———	———	·····	·····	·····		———

Cytherideis wilberti Puri

Plate 9, figs. 9-10

Cytherideis wilberti Puri, 1952b, Jour. Paleontology, vol. 26, pp. 908-910, pl. 130, figs. 9-10; text figs. 7-8.

This species was described originally from the Chipola facies. It occurs commonly at the Chipola facies localities nos. 3, 8, 9; Oak Grove facies locality no. 13 and *Cancellaria* facies zone localities nos. 48, 50.

Genus KRITHE Brady, Crosskey and Robertson, 1874

Krithe cf. *K. reniformis* (Brady)

Paradoxostoma (?) *reniformis* Brady, 1868c, Ann. Mag. Nat. Hist., 4th ser., vol. 2, p. 224, pl. 15, figs. 1, 2.

?*Krithe reniformis* Brady and Norman, 1889, Roy. Dublin Soc. Trans., ser. 2, vol. 4, p. 182, pl. 21, figs. 23, 24.

Krithe reniformis Müller, 1894, Zool. Station, Naples, Mon. 21, p. 258, pl. 28, fig. 24; pl. 30, figs. 1, 3, 22, 23.

Krithe reniformis Müller, 1912, Die Tierreich, L. 21, p. 334.

This species occurs commonly at the Chipola facies locality no. 10. So far as is known, it does not occur in any other locality.

Subfamily PARADOXOSTOMINAE Brady and Norman, 1839

Genus PARADOXOSTOMA Fischer, 1855

Paradoxostoma (?) *delicata* Puri, n. sp.

Plate 15, fig. 3; text fig. 12f

Carapace, small, elongate, subtriangular. Dorsal margin arched; ventral margin slightly concave in front of the middle. Posterior end broadly rounded. Both the dorsal and the ventral margins converge toward the anterior which is produced. Surface of the carapace smooth and glassy. Viewed from inside, the valves are moderately deep, flanked with marginal area which is evident at the anterior. Hinge toothless; articulating by means of flanges and grooves.

This species is placed tentatively in the genus *Paradoxostoma* with which it has apparent affinities. It could be identified easily by its elongate, subtriangular, smooth carapace.

This species occurs commonly at the *Ecphora* facies locality no. 43 and the *Cancellaria* facies localities nos. 53 and 58.

Dimensions of holotype no. 3033, a right valve from locality no. 58: length .456 mm.; height .219 mm.

Paradoxostoma elongata Puri, n. sp.

Plate 15, fig. 2; text fig. 12c

Carapace, small, elongate, almost two and a half to one; fusiform in dorsal view. Dorsal margin arched; ventral slightly concave anterior to the middle. Anterior end broadly rounded, posterior end slightly oblique above, broadly rounded below. Greatest height slightly posterior to the middle. Surface of the carapace smooth and shiny. Viewed from inside, the valves are moderately shallow; flanked with marginal area, which increases in width from the posterior to the anterior end, widest at the anterior end. Marginal pore canals short and straight and moderately spaced. Hinge and other internal characters normal to the genus.

This species could be easily identified by its elongate smooth carapace, which is fusiform in side view.

This species occurs commonly at the Chipola facies localities nos. 3, 9, 10 and the *Ecphora* facies locality no. 43.

Dimensions of holotype no. 3032, a complete carapace from locality no. 43: length .557 mm.; height .219 mm.

Paradoxostoma robusta Puri, n. sp.

Plate 15, fig. 1; text figs. 12d, e

Carapace, medium, elongate, subtriangular in side view, fusiform in dorsal view. Dorsal margin arched; ventral margin almost straight. Anterior end oblique above, broadly rounded below. Posterior end angular and produced. Greatest height slightly posterior to the middle. Surface of the carapace smooth and polished. Viewed from inside the valves are shallow; flanked with marginal area, which increases in width from the posterior to the anterior end. Marginal pore canals of varied length, generally widely spaced. Hinge and other internal features normal to the genus.

This species resembles *P. variabile* (Baird) in its general shape but it is more elongate than *P. variabile* and has an acute posterior end. *P. variabile* is broadly rounded at both ends.

This species occurs frequently at the Chipola facies locality no. 11 and the *Ecphora* facies *locality* no. 44.

Dimensions of holotype no. 3031, a complete carapace from locality no. 44: length .743 mm.; height .304 mm.

Genus PELLUCISTOMA Coryell and Fields, 1937

Pellucistoma magniventra Edwards

Plate 15, fig. 4; text fig. 12a

Pellucistoma magniventra Edwards, 1944, Jour. Paleontology, vol. 18, p. 528, pl. 88, figs. 33-35.

Pellucistoma cf. *P. magniventra* Edwards, Swain, 1951, U. S. Geol. Survey Prof. Paper 234-A, p. 52.

This species described originally from the Duplin marl of North Carolina, also occurs in the subsurface upper Miocene of North

Carolina (Swain 1951, p. 52). In the Florida Miocene, it occurs only at the *Cancellaria* facies locality no. 52.

Dimensions of plesiotype no. 3034, a left valve from locality no. 52: length .574 mm.; height .287 mm.

Pellucistoma tumida Puri, n. sp.
Plate 15, fig. 5; text fig. 12b

Carapace small, subquadrate, lenticular in dorsal view. Dorsal margin straight in the middle; sloping in front and behind. Ventral margin concave in the middle. Anterior end broadly rounded; posterior end subacute, compressed postventrally. Surface of the carapace smooth and polished. Viewed from inside, the valves are moderately deep. Marginal areas wide along the anterior, posterior and ventral sides; pore canals long, straight and numerous. Hinge normal to the genus.

This species could be easily distinguished from *P. howei* Coryell and Fields by its subquadrate and strongly postventrally compressed carapace. *P. howei* is subovate.

This species occurs commonly at the *Ecphora* facies localities nos. 43 and 44.

Dimensions of holotype no. 3035, a complete carapace from locality no. 43: length .490 mm.; height .270 mm.

TABLE 10

RANGE OF SUBFAMILY PARADOXOSTOMINAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Paradoxostoma elongata	———					———	
Paradoxostoma robusta	———					———	
Paradoxostoma (?) delicata						———	———
Pellucistoma magniventra							———
Pellucistoma tumida						———	

Subfamily MICROCYTHERINAE Klie, 1938
Genus MICROCYTHERE G. W. Müller, 1894
Microcythere johnsoni Mincher

Microcythere johnsoni Mincher, 1941, Jour. Paleontology, vol. 15, p. 344, pl. 47, fig. 4.

Typical specimens of this species occur at the Chipola facies localities nos. 4 and 11.

Microcythere stephensoni Puri, n. sp.
Plate 16, figs. 11, 12; text figs. 12g, h

Carapace medium, elongate. Dorsal margin almost straight; ventral margin concave in front, arched behind. Anterior end broadly rounded below, obliquely above; posterior end subangular. Surface of the carapace smooth. Viewed from inside, the valves are moderately shallow; both anterior and posterior margins wide; marginal pore canals obscured by the thickness of the carapace. Hinge in the right valve with an anterior crenulate tooth with three cusps, a postjacent socket and posterior simple tooth connected with the anterior elements of the hingement with a shallow groove.

Named in honor of Morton B. Stephenson, Stanolind Oil Company.

This species resembles *M. moresiana* Stephenson in its general shape but its posterior end is subangular and the posterior portion of the carapace is very thick and broad while *M. moresiana* is highest anterior to the middle.

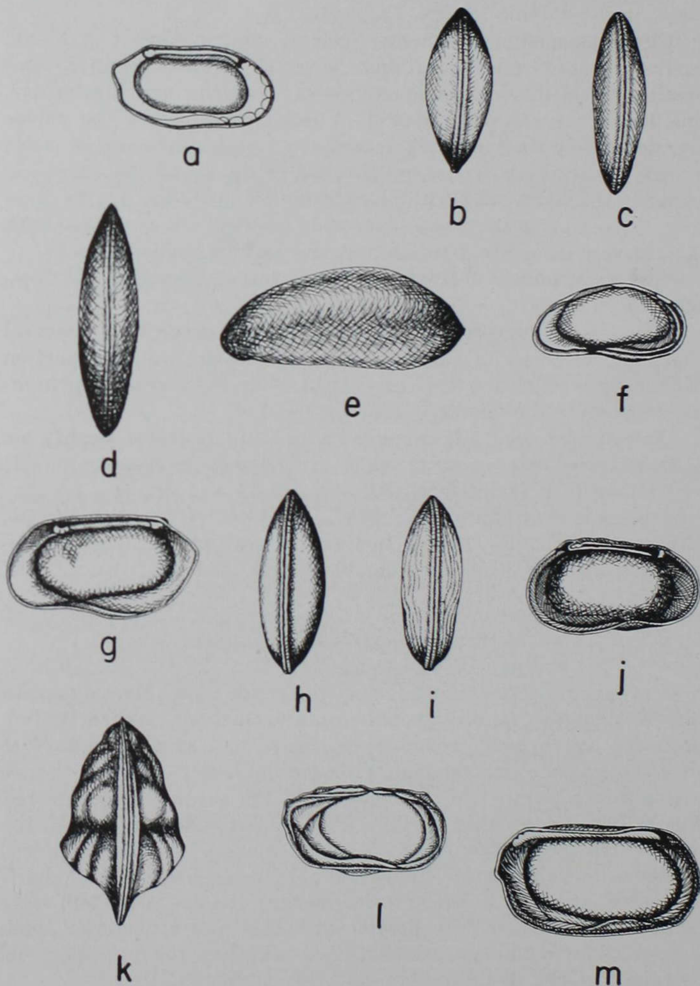
This species occurs frequently in the Chipola facies locality no. 3; Oak Grove facies locality no. 16; *Ecphora* facies locality no. 43; and *Cancellaria* facies localities nos. 48, 53 and 58.

Dimensions of holotype no. 3057, a right valve from locality no. 42: length .591 mm.; height .304 mm.; paratype no. 3058, a complete carapace from locality no. 44: length .574 mm.; height .287 mm.

Microcythere striata Puri, n. sp.
Plate 17, figs. 9, 10; text figs. 12i, j

Carapace medium, elongate; oblong in side view. Dorsal margin almost straight; ventral margin concave in front, arched behind. Anterior end broadly rounded; posterior end subacute. Surface of the carapace ornamented with eleven heavy ribs which are straight and parallel to one another in the posterior portion but merge into one another in the anterior. Viewed from inside, the valves are moderately deep; anterior margin broadly rounded; posterior margin narrow. Marginal pore canals are long and shortly spaced, about 16 in the anterior margin. Hinge in the left valve with an anterior tooth, a postjacent socket and a posterior tooth connected by a narrow crenulate bar which in the posterior end is raised to look like a tooth.

This species is closely related to *M. johnsoni* but it differs from it in having eleven heavy ribs, which in the posterior portion are straight. *M. johnsoni* has similar ribs but they are sinuous throughout.



Text Figure 12

This species occurs commonly at the Chipola facies localities nos. 1, 3, 5, 11 and 12.

Dimensions of holotype no. 3055, a complete carapace from locality no. 1: length .591 mm.; height .304 mm.; paratype no. 3056, a left valve from locality no. 12: length .540 mm.; height .304 mm.

Subfamily BYTHOCYTHERINAE Sars, 1926

Genus LUVULA Coryell and Fields, 1937

Luvula howei Puri, n. sp.

Plate 15, fig. 11; text fig. 13b

Carapace medium, elongate; shaped more or less like a parallelogram in side view. Dorsal margin almost straight; ventral margin concave in front; arched behind. Greatest height slightly pos-

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Explanation of Text Figure 12

All figures approximately X50. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a—*Pellucistoma magniventra* Edwards, locality no. 52, plesiotype no. 3034, a left valve.

b—*Pellucistoma tumida* Puri, n. sp., locality no. 43, holotype no. 3035, dorsal view of a complete carapace.

c—*Paradoxostoma elongata* Puri, n. sp., locality no. 43, holotype no. 3032, dorsal view of a complete carapace.

d, e—*Paradoxostoma robusta* Puri, n. sp., locality no. 44, holotype no. 3031. d, dorsal view of a complete carapace; e, left valve view of the same specimen.

f—*Paradoxostoma* (?) *delicata* Puri, n. sp., locality no. 58, holotype no. 3033, a right valve.

g, h—*Microcythere stephensoni* Puri, n. sp. g, holotype no. 3057, a right valve from locality no. 42; h, paratype no. 3058, dorsal view of a complete carapace from locality no. 44.

i, j—*Microcythere striata* Puri, n. sp. i, holotype no. 3055, dorsal view of a complete carapace from locality no. 1; j, paratype no. 3056, a left valve from locality no. 12.

k, l, m—*Monoceratina bifurcata* Puri, n. sp. k, holotype no. 3039, dorsal view of a complete carapace from locality no. 1; l, paratype no. 3037, a left valve from locality no. 12; m, paratype no. 3040, a left valve from locality no. 48.

terior to the middle. Anterior end broadly rounded below, slightly oblique above; posterior acute and subtriangular, conspicuously produced. Surface of the carapace smooth. Viewed from inside the valves are moderately shallow; marginal areas very wide; marginal pore canals long and straight. Hinge in the left valve with blade-like anterior and posterior teeth connected by a straight bar.

This species differs from *L. palmerae* in being elongate and slender, and in possessing wider marginal areas.

Named in honor of Henry V. Howe, Louisiana State University.

This species occurs commonly at the Chipola localities nos. 1, 3, 5, 8, 9, 10, 12; *Ecphora* facies localities nos. 43, 44; and *Cancellaria* facies locality no. 52.

Dimensions of holotype no. 3041, a left valve from locality no. 12: length .523 mm.; height .236 mm.

Luvula moccasinensis Puri, n. sp.
Plate 15, fig. 13; text figs. 13c, d

Carapace small, subrectangular in sideview. Dorsal margin slightly concave in the middle, ventral margin sinuous. Anterior end broadly rounded; posterior subacute and truncated. Surface of the carapace coarsely ribbed in the ventral portion, with a well-developed postventral ridge. Two of such ridges are situated dorsally to the postventral ridge; the ridges dorsal to the postventral ridge and the postventral are connected near the posterior end by a slightly oblique ridge. Rest of the carapace is indistinctly striated. Viewed from inside, the valves are shallow; marginal areas are moderately wide; marginal pore canals are indistinct. Hinge normal to the genus.

This species could be easily identified from other species of *Luvula* by its prominent postventral ridge and its subrectangular shape.

Named after Moccasin Creek, Bay County, Florida.

This species occurs frequently at the *Cancellaria* facies locality no. 52.

Dimensions of holotype no. 3043, a right valve from locality no. 52: length .405 mm.; height .185 mm.

Luvula palmerae Coryell and Fields
Plate 15, fig. 12; text fig. 13a

Luvula palmerae Coryell and Fields, Am. Mus. Novitates, no. 956, p. 16, pl., figs. 16a, b.

This species, originally described from the Gatun Miocene of Panama, also occurs at the *Arca* facies localities nos. 24, 26, 27, 30;

Ecphora facies localities nos. 37, 39, 40; and *Cancellaria* facies localities nos. 50 and 58.

Dimensions of plesiotype no. 3042, a complete carapace from locality no. 30: length .490 mm.; height .253 mm.

Genus MONOCERATINA Roth, 1928

Monoceratina bifurcata Puri, n. sp.

Plate 15, figs. 6-10; text figs. 12k-m

Carapace, medium, subquadrate; in dorsal view, shaped like a double wedge, gently sloping towards the anterior end, steeply sloping towards the posterior end. Dorsal margin slightly convex in the middle; ventral margin almost straight. Anterior end broadly rounded; posterior subacute and truncated. Carapace, alate, divided into an anterior and posterior lobe by a median, vertical sulcus. Surface of the carapace finely striated; the striation arranged around the anterior and the posterior lobes. Viewed from inside, the valves are deep; both the anterior and posterior margins are wide. Hinge normal to the genus.

This species could be distinguished easily by its subquadrate, alate, carapace with a well-developed median sulcus and by its finely striated surface.

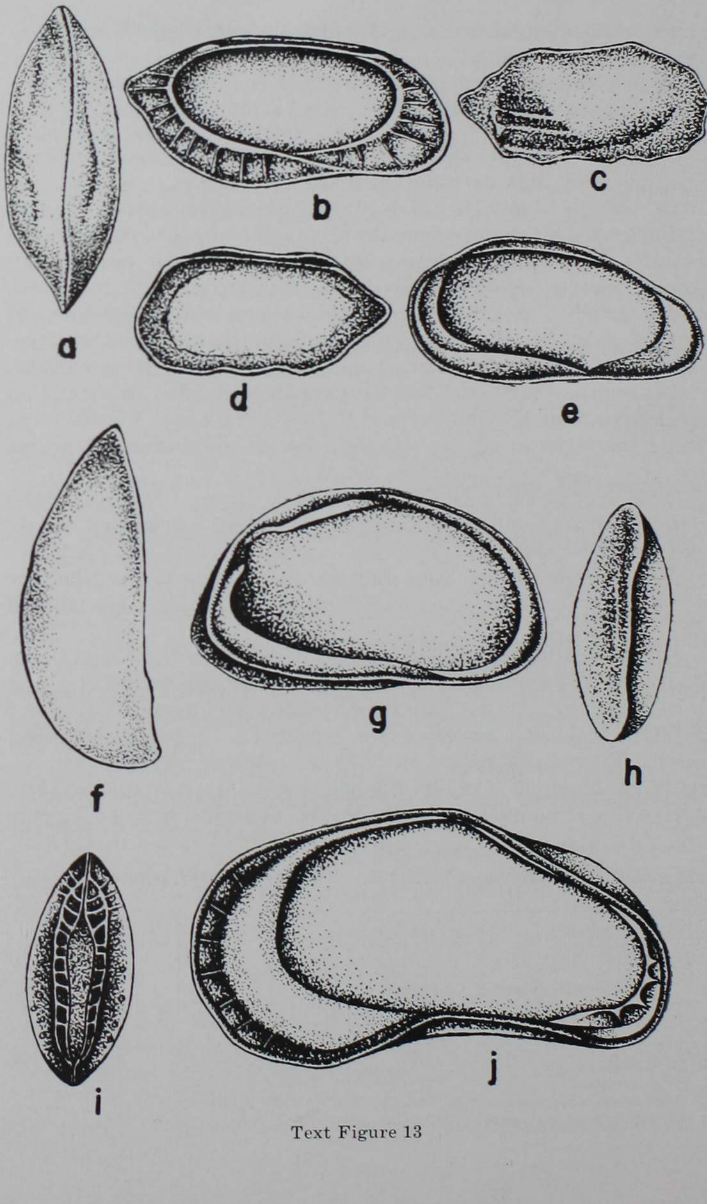
This species occurs commonly at the Chipola facies localities nos. 1, 3, 9, 11, 12 and the *Cancellaria* facies localities nos. 48 and 52.

Dimensions of paratype no. 3036, a right valve from locality no. 2: length .760 mm.; height .371 mm.; paratype no. 3037, a left valve from locality no. 12: length .523 mm.; height .287 mm.; paratype no. 3038, a left valve from locality no. 12: length .608 mm.; height .304 mm.; holotype no. 3039, a complete carapace from locality no. 1: length .676 mm.; height .338 mm.; paratype no. 3040, a left valve from locality no. 48: length .659 mm.; height .354 mm.

TABLE 11

RANGE OF SUBFAMILY BYTHOCERATINAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Luvula howei	——					——	——
Luvula palmerae					——	——	——
Luvula moccasinensis							——
Monoceratina bifurcata	——						——



Text Figure 13

Subfamily XESTOLEBERINAE Sars, 1928

Genus XESTOLEBERIS Sars, 1866

Xestoleberis choctawhatcheensis Puri, n. sp.

Plate 16, fig. 6; text figs. f, g

Carapace large for the genus, subtriangular. Dorsal margin arched; bottom inflated, flat or depressed. Anterior margin oblique above, broadly rounded below. Posterior margin subacute, truncated. Surface of the carapace porcellaneous. Viewed from inside, the valves are deep. Both the anterior and posterior margins are narrow; marginal pore canals few, small and straight. Hinge and other internal characters normal to the genus.

This species could be identified easily by its inflated flat or depressed bottom.

This species occurs commonly at the *Ecphora* facies locality no. 42 and the *Cancellaria* facies localities nos. 52 and 58.

Dimensions of holotype no. 3052, a left valve from locality no. 42: length .591 mm.; height .338 mm.

Explanation to Text Figure 13

All figures approximately X100. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a—*Luvula palmerae* Coryell and Fields, locality no. 30, plesiotype no. 3042, dorsal view of a complete carapace.

b—*Luvula howei* Puri, n. sp., locality no. 12, holotype no. 3041, a left valve.

c, d—*Luvula moccasinensis* Puri, n. sp., locality no. 52, holotype no. 3043, a right valve; c, outside view; d, internal view of the same specimen.

e—*Xestoleberis miocenicus* Puri, n. sp., locality no. 53, a right valve.

f, g—*Xestoleberis choctawhatcheensis* Puri, n. sp., locality no. 42, holotype no. 3052, a left valve; f, dorsal view; g, inside view.

h, i—*Xestoleberis triangularis* Puri, n. sp., locality no. 39, holotype no. 3047, a complete carapace. h, dorsal view; i, ventral view.

j—*Eucythere triangulata* Puri, n. sp., locality no. 42, holotype no. 3053, a right valve.

Xestoleberis miocenicus Puri, n. sp.
Plate 16, fig. 5; text fig. 13e

Carapace small, elongate. Dorsal margin arched; ventral margin concave anterior to the middle. Anterior end broadly rounded; posterior end subacute. Surface of the carapace smooth. Viewed from inside, the vaives are moderately shallow; anterior margin broader than the posterior margin with 16 to 20 marginal pore canals. Hinge and other internal features normal to the genus.

This species can be distinguished from *X. triangularis* by its elongate, smooth carapace.

This species occurs commonly at the Chipola facies localities nos. 1, 4, 6, 7, 8, 10, 11, 12; and the *Cancellaria* facies localities nos. 52, 53 and 58.

Dimensions of holotype no. 3051, a right valve from locality no. 53: length .490 mm.; height .236 mm.

Xestoleberis triangularis Puri, n. sp.
Plate 16, figs. 1-4; text figs. 13h, i

Carapace, minute, elongate, triangular; lenticular in dorsal view. Dorsal margin highly arched; ventral margin slightly concave in the middle. Greatest height slightly posterior to the middle. Anterior end short and truncated on the top; posterior end, subangular and produced. Surface of the carapace smooth and hyalin. Viewed from inside, the valves are moderately shallow. Anterior margin wide, marginal pore canals few and widely spaced; posterior margin narrower than the anterior. Hinge and other internal features normal to the genus.

This species can easily be identified by its very small, elongate, triangular carapace.

This species occurs commonly at the Chipola facies localities nos. 3, 11; the *Arca* facies localities nos. 27, 30; the *Ecphora* facies localities nos. 36, 38, 39, 43, 44; and the *Cancellaria* facies localities nos. 49, 50, 53, 54, 55, 57 and 58.

Dimensions of holotype no. 3047, paratypes nos. 3048, 3049, 3050: length .304 mm.; height .135 mm. All of the figures specimens came from locality no. 39.

Subfamily EUCYTHERINAE Puri, new subfamily
Type genus: EUCYTHERE Brady, 1866

Carapace shaped like *Cytheridea*, strongly triangular; surface smooth, pitted or reticulate. Hinge essentially toothless, but the two valves articulate by two sets of noncrenulate grooves and flanges. Marginal areas broad, radial canals moderately numerous, widely spaced, sometimes bifurcating. Line of concrescence departs from the inner margin at both anterior and posterior ends. Muscle scars, an oblique row of four with additional scar in front.

This subfamily is monotypic and at the present consists of the type genus *Eucythere* Brady. Further investigations will doubtless discover some of its related genera.

This subfamily is related to Cytherideidinae Puri (1952, p. 905) in that both are toothless and the hinge articulates by means of noncrenulate grooves and flanges. Eucytherinae, however, has two sets of grooves and flanges whereas Cytherideidinae exhibits three or more sets of such grooves and flanges. Line of concrescence in Cytherideidinae usually parallels the inner margin while it departs from the inner margin at both anterior and posterior margins in Eucytherinae. Muscle scar pattern in Eucytherinae consists of an oblique row of four scars, in front of which is an additional scar; in Cytherideidinae there is a vertical row of four with additional scars varying from one to six.

The genus *Eucythere* has hitherto been classified in the subfamily Cytherideinae Sars, 1925. The subfamily Cytherideinae is here restricted to forms like *Cytheridea* Bosquet, *Haplocytheridea* Stephenson, *Dolocytheridea* Triebel, *Anomocytheridea* Stephenson, *Clithrocytheridea* Stephenson, *Heterocyprideis* Elofson, *Paracytheridea* Müller, *Pharactocytheridea* Sutton and William, *Schuleridea* Swartz and Swain and *Ovocytheridea* Grekoff that show well-developed sets of crenulate teeth and sockets. The author does not believe that Eucytherinae is related to any of the above mentioned genera that typically belong to Cytherideinae. Its relationship lies with Cytherideidinae and it stemmed from forms like *Cytherideis* early in the Tertiary times.

Genus EUCYTHERE Brady, 1866

Cytheropsis Sars, 1865, p. 57 (not *Cytheropsis* M'Coy, 1855)
Eucythere Brady, 1866, p. 429; Müller 1894, p. 362; Lienenklaus 1900, p. 524; Müller 1912, p. 333; Sars 1925, p. 161; Alexander 1934, p. 226; 1936, p. 689; Howe 1936, p. 143; Triebel 1940, p. 161; Bonnema 1940, p. 116; Edwards 1944, p. 513.

Genotype: *Cythere declivis* Norman, 1865, p. 16, pl. 5, figs. 9-12

Carapace shaped like *Cytheridea*, strongly triangular, lenticular in side view, highest anteriorly. Anterior end broadly rounded, posterior end obliquely rounded, very strongly compressed. Dorsal margin arched; ventral margin slightly concave in the middle. Surface of the carapace smooth, pitted or reticulate. Hinge in the right valve consists of a dorsal groove bounded by a dorsal and a ventral flange and an anterior short flange below which is a groove that joins the dorsal groove at the antero-dorsal margin. Line of concrescence departs from the inner margin at both the anterior and posterior, more strongly at the former. Muscle scar pattern consists of an oblique row of four scars, with a horse-shoe shaped scar in front. Both anterior and posterior margins wide, radial pore canals straight, widely spaced and moderate in number.

Range: Paleocene to Recent.

Eucythere triangulata Puri, n. sp.

Plate 16, figs. 7, 8; text fig. 13j

Carapace, large, subtriangular in side view. Dorsal margin arched; ventral margin slightly concave in the middle. Greatest height slightly anterior to middle. Anterior end broadly and obliquely rounded; produced below. Both the dorsal and the ventral margins converging strongly towards the posterior, which is narrow and broadly rounded. Surface of the carapace smooth, hyalin. Scattered normal pore canals visible. Viewed from the inside, the valves are moderately deep. Both the anterior and posterior margins wide. Marginal pore canals short, widely spaced; about 10 in the anterior margin. Hinge and other internal characters normal to the genus.

This species closely resembles *E. chickasawhayensis* Howe in its general outline but differs from it in having a smooth surface and in being broadly rounded in the posterior end. *E. chickasawhayensis* is obliquely rounded in the posterior end and its surface is reticulate.

This species occurs commonly at the *Arca* facies localities nos. 24, 28 and the *Ecphora* facies localities nos. 41 and 42.

Dimensions of holotype no. 3053, a right valve from locality no. 42: length .777 mm.; height .371 mm.; paratype no. 3054, a left valve from locality no. 24: length .540 mm.; height .287 mm.

Suborder PLATYCOPA Sars; 1866

Family CYTHERELLIDAE Sars, 1866

Genus CYTHERELLA Jones, 1849

Cytherella chipolensis Puri, n. sp.

Plate 17, figs. 5, 6; text figs. 14e-g

Carapace medium, oblong in dorsal view; fusiform anteriorly; oblong-ovate in side view. Dorsal margin slightly arched; ventral margin slightly concave in the middle. Both the anterior and posterior ends broadly rounded. Posterior end conspicuously thicker in the female; not so in the male. Surface of the carapace smooth, porcellanous. Viewed from inside, the valves are shallow. There are well-developed ventral and dorsal flanges. Both the anterior and posterior margins are very narrow; marginal pore canals not observed.

This species occurs commonly at the Chipola facies localities nos. 3, 4, 6, 8, 9, 11 and 12. As far as is known this species occurs only in the Chipola facies.

Dimensions of paratype no. 3045, a left valve: length .574 mm.; height .338 mm.; holotype no. 3046, a right valve: length .659 mm.; height .422 mm. Both the figured specimens came from locality no. 8.

Genus CYTHERELLOIDEA Alexander, 1929

Cythere (Cytherella) Jones, 1849, p. 31, pl. 7, figs. 26a-i.
Cytherella Sars, 1865 (1866), pp. 124, 125.
Cytherelloidea Alexander, 1929, p. 55, pl. 2, fig. 12; Van Veen, 1932, p. 30; Bonnema, 1940-1941, p. 95; LeRoy, 1941, p. 612; Edwards, 1944, p. 505; Van den Bold, 1946, p. 20; Sexton, 1951, p. 809.

Cytherelloidea leonensis Howe
Plate 17, fig. 3; text fig. 14c

Cytherelloidea leonensis Howe, 1934, Jour. Paleontology, vol. 8, p. 34, pl. 5, fig. 9.
Cytherelloidea purii Sexton, 1951, Jour. Paleontology, vol. 25, p. 815, pl. 117, fig. 16.

This species was described originally from the *Ecphora* facies of the Choctawhatchee formation. Species described by Sexton (1951, p. 815) as *Cytherelloidea purii* from the *Ecphora* facies locality no. 43, is conspecific with *Cytherelloidea leonensis* Howe.

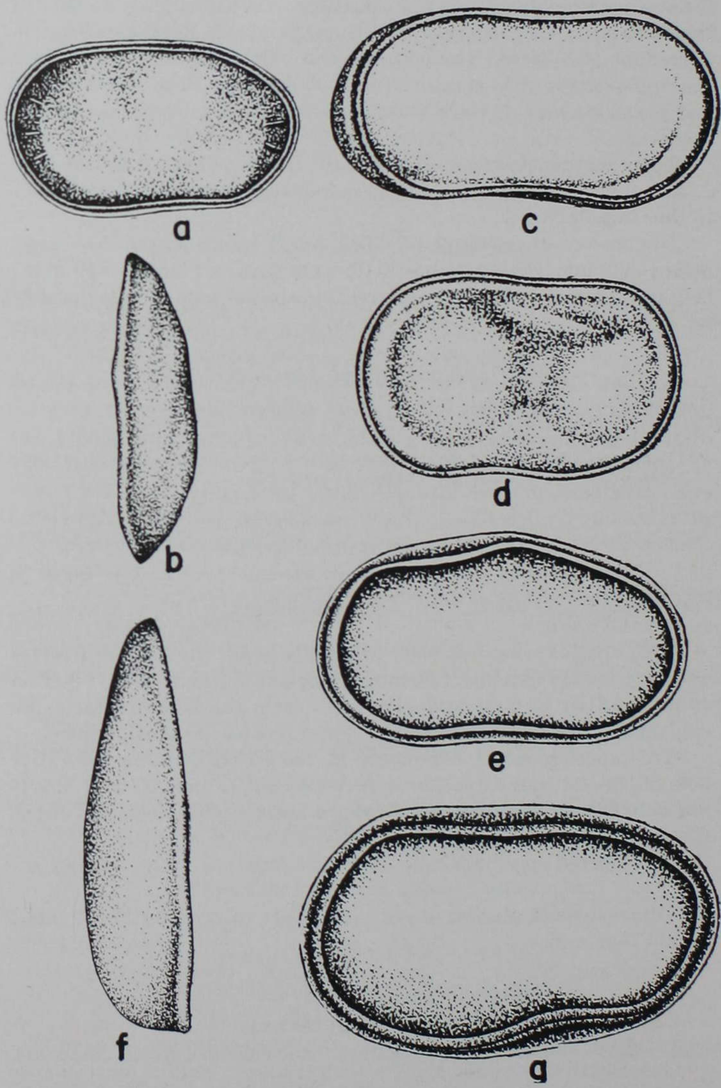
This species occurs commonly at the *Ecphora* facies localities nos. 36, 38, 44 and *Cancellaria* facies localities nos. 52 and 58. It has only been observed in the *Ecphora* and *Cancellaria* facies of the Choctawhatchee Stage.

The figured specimen came from the *Ecphora* facies locality no. 44.

Dimensions of plesiotype no. 3062, a left valve: length .659 mm.; height .338 mm.

Cytherelloidea moccasinensis Sexton
Plate 17, figs. 1, 2; text fig. 14d

Cytherelloidea moccasinensis Sexton, 1951, Jour. Paleontology, vol. 25, pp. 814, 815, pl. 117, fig. 14.
Cytherelloidea blakei Sexton, 1951, Jour. Paleontology, vol. 25, p. 815, pl. 117, fig. 15.



Text Figure 14

This species was described from the *Cancellaria* facies of the Choctawhatchee Stage. Species described as *Cytherelloidea blakei* Sexton (1951, p. 117) from the *Ecphora* facies locality no. 44 is conspecific with *Cytherelloidea moccasinensis.*

This species occurs commonly at the *Arca* facies locality no. 27; the *Ecphora* facies localities nos. 42, 43, 44; and *Cancellaria* facies localities nos. 48, 50, 52, 53, 55 and 58. This species has only been observed in the *Arca, Ecphora* and *Cancellaria* facies of the Choctawhatchee Stage.

The figured specimens came from the *Cancellaria* facies localities no. 52 and no. 58.

Dimensions of plesiotype no. 3059, a left valve from locality no. 58: length .557 mm.; height .338 mm.; plesiotype no. 3060, a left valve from locality no. 52: length .743 mm.; height .405 mm.

Cytherelloidea umbonata Edwards
Plate 17, fig. 7

Cytherelloidea umbonata Edwards, 1944, Jour. Paleontology, vol. 18, p. 506, pl. 85, figs. 1, 2.

Cytherelloidea anderseni Sexton, 1951, Jour. Paleontology, vol. 25, p. 815, pl. 117, fig. 17.

This species was described from the Duplin marl of North Carolina. Species described by Sexton (1951, p. 815) as *Cytherelloidea anderseni* is conspecific with *Cytherelloidea umbonata* Edwards.

This species occurs commonly in the Chipola facies localities nos. 1 and 12.

The figured specimen came from the Chipola facies locality no. 1.

Explanation to Text Figure 14

All figures approximately X100. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figs. a, b—*Platella gatunensis* Coryell and Fields, plesiotype no. 3044, a right valve from locality no. 48. a, inside view; b, dorsal view.

c—*Cytherelloidea leonensis* Howe, plesiotype no. 3062, a left valve from locality no. 44.

d—*Cytherelloidea moccasinensis* Sexton, plesiotype no. 3059, a left valve, from locality no. 58.

e, f, g—*Cytherella chipolensis* Puri, n. sp., from locality no. 8. e, paratype no. 3045, a left valve; f, holotype no. 3046, a right valve, dorsal view; g, inside view of the same specimen.

Cytherelloidea vernoni Sexton
Plate 17, figs. 8, 9

Cytherelloidea vernoni Sexton, 1951, Jour. Paleontology, vol. 25. p. 814, pl. 117, fig. 13.

This species was described from the Chipola facies. It occurs commonly at the Chipola facies localities nos. 1 and 3.

The figured specimens came from the Chipola facies localities nos. 1 and 3.

Genus PLATELLA Coryell and Fields, 1937
Platella gatunensis Coryell and Fields
Plate 17, fig. 4; text fig. 14a

Platella gatunensis Coryell and Fields, 1937, Am. Mus. Novitates, No. 956, p. 3, figs. 2a, b.

This species, described from the Gatun Miocene of Panama, also occurs at the *Cancellaria* facies locality no. 48.

Dimensions of plesiotype no. 3044, a right valve from locality no. 48: length .490 mm.; height .287 mm.

TABLE 12

RANGE OF FAMILY CYTHERELLIDAE IN THE MIOCENE OF THE FLORIDA PANHANDLE

Genus and Species	Chipola Facies	Oak Grove Facies	Shoal River Facies	*Yoldia* Facies	*Arca* Facies	*Ecphora* Facies	*Cancellaria* Facies
Cytherella chipolensis	——						
Cytherelloidea umbonata	——						
Cytherelloidea vernoni	——						
Cytherelloidea moccasinensis					——	——	——
Cytherelloidea leonensis						——	——
Platella gatunensis							——

BIBLIOGRAPHY

Alexander, C. I.
1929 *Ostracoda of the Cretaceous of north Texas:* Univ. Texas Bull. 2907, pp. 1-137, pls. 1-10.
1933 *Shell structure of the genus Cytheropteron, and species from the Cretaceous of Texas:* Jour. Paleontology, vol. 7, pp. 181-214, pls. 25-27.

Bergquist, H. R.
1942 *Scott County fossils; Jackson Foraminifera and Ostracoda:* Mississippi Geol. Survey Bull. 49, 146 pp., 11 pls.

Blake, C. H.
1929 *New Crustacea from the Mount Desert Region:* Biol. Survey Mt.

Desert Region, pt. 3, Crustacea, pp. 3-24, 15 figs.
1931 *Notes on Ostracoda:* Jour. Paleontology, vol. 5, pp. 160-163.

Blake, D. B.
1950 *Gosport Eocene Ostracoda from Little Stave Creek, Alabama:* Jour. Paleontology, vol. 24, pp. 174-184, pls. 29, 30.

Bonnema, J. H.
1940-1941 *Ostracoda aus der Kreide des Untergrundes der nordostlichen Niederlanden:* Natuurhist. Maanblad no. 27, pp. 91-95, 104-108, 115-118, 129-132, pls. 1-4; no. 28, pp. 8-10, 21-24, 26-29, 40-43, 56-60, 70-72, pls. 5-7.

Brady, G. S.
1866 *On new or imperfectly known species of marine Ostracoda:* Zool. Soc. London Trans., vol. 5, pp. 359-393, pls. 57-62.
1868a *A synopsis of the Recent British Ostracoda:* The Intellectual Observer, vol. 12, pp. 110-120, pls. 1, 2.
1868b *A monograph of the Recent British Ostracoda:* Linnaean Soc. London Trans., vol. 26, pp. 353-495, pls. 23-41.
1868c *Contributions to the study of the Entomostracea No. 3; Marine Ostracoda from Tenedos:* Ann. Mag. Nat. Hist., 4th ser., vol. 2, pp. 220-225, pls. 14, 15.
1869 *In les Fonds de la Mer:* vol. 1, pp. 54-163, pls. 4-19.
1869 *On the Crustacean fauna of the salt-marshes of Northumberland and Durham:* Nat. Hist. Trans. of Northumberland and Durham, vol. 3, pp. 120-136, pls. 4, 5.
1880 Report of the scientific results of the voyage of H.M.S. Challenger, during the years of 1873-1876, vol. 1, pt. 3.
1889 & 1896 (and Norman, A. M.) A monograph of the marine and freshwater Ostracoda of the North Atlantic and of northwestern Europe: Royal Dublin Soc. Sci. Trans., 2nd ser., vol. 4 (1889), pp. 63-270, pls. 8-23; vol. 5 (1896), pp. 621-726, pls. 50-68.

Chambers, J. (see Howe, 1935)

Chapman, F.
1935 *Report on samples of surface Tertiary rocks and a bore sample containing Ostracoda from Queensland:* Royal Soc. Queensland Proc., vol. 46, pp. 66-71, 1 pl.

Coryell, H. N.
1937 (and Fields, Suzanne) *A Gatun Ostracode fauna from Cativa Panama:* Am. Mus. Novitates, no. 956, 18 pp., 2 pls.

Cushman, J. A.
1906 *Marine Ostracoda of Vineyard Sound and adjacent waters:* Boston Soc. Nat. History Proc., vol. 32, pp. 359-385, pls. 27-38.
1932 (and Ponton, G. M.) *The Foraminifera of the upper, middle and part of the lower Miocene of Florida:* Florida Geol. Survey Bull. 9, 147 pp., 17 pls.

Doeglas, D. J.
1931 *Ostrakoden van N. O. Borneo:* Overdruk uit Wetenschappelijke Mededeelingen van den Dienst van den Mijnbouw in Nederlandsch-Indies, no. 17, pp. 25-54, pls. 4-5.

Dubovsky, N. F.
1939 *Materials contributory to the knowledge of the Ostracod fauna of the Black Sea:* Trav. Sta. Biol. Karadagh 5, 1939, pp. 3-38. [Russian with German Resume].

Edwards, R. A.
1944 *Ostracoda from the Duplin marl (upper Miocene) of North Carolina:* Jour. Paleontology, vol. 18, pp. 505-528, pls. 85-88.

Elofson, O.
1941 *Zur Kenntnis der mariner Ostracoden Schwedens mit besonder Berucksichtigung des Skageraks:* Zool. Bidr., Uppsala, vol. 19, pp. 215-534, 52 text figs., 42 maps.

Egger, Joseph Georg.
1858 *Die Ostrakoden der Miocän-Schichten bei Ortenburg in Neider Bayern:* Jahrb. für Mineral. Geog. Geol. Petrefackt. pp. 417, 418, pl. 15, figs. 4a-c.

Fields, Suzanne (see Coryell)

Garrett, J. B. (see also Howe, 1934)
1936 *Occurrences of Nonionella cockfieldensis at Claiborne Bluff, Alabama:* Jour. Paleontology, vol. 10, pp. 785-786 (list of Ostracodes).

Guide Book
1948 Mississippi Geological Society, Sixth Field Trip.

Hirschmann, N.
1916 *Ostracoda of the Baltic Sea collected by N. M. Knipovitch and S. A. Pavlovitch in the summer of* 1908: [in Russian] Ann. Mus. Petrol., vol. 20, 1915 (1916) pp. 569-597, 27 figs.

Howe, H. V.
1934 *The Ostracode genus Cytherelloidea in the Gulf Coast Tertiary:* Jour. Paleontology, vol. 8, pp. 29-34.
1934 (and Garrett, J. B.) *Louisiana Sabine Eocene Ostracoda:* Louisiana Geol. Survey Bull. 4.
1935 (and Chambers, J.) *Louisiana Jackson Eocene Ostracoda:* Louisiana Geol. Survey Bull. 5, pp. 1-65, pls. 1-6.
1935 (and Graduate Students) *Ostracoda of the Arca zone of the Choctawhatchee Miocene of Florida:* Florida Geol. Survey Bull. 13, pp. 1-37, 4 pls.
1936 (and Law, J.) *Louisiana Vicksburg Oligocene Ostracoda:* Louisiana Geol. Survey Bull. 7, pp. 1-96, 6 pls.

Hussey K. M. (see Murray)

Israelsky, M. C.
1929 *Upper Cretaceous Ostracoda of Arkansas:* Arkansas Geol. Survey Bull. 2, pp. 1-28, pls. 1A-4A.

Jennings, P. H.
1936 *A microfauna from the Monmouth and basal Rancocas group of New Jersey:* Am. Paleontology Bull., vol. 23, pp. 1-62.

Jones, T. R.
1849 *A monograph of the Entomostraca of the Cretaceous formation of England:* Paleont. Soc. London.
1850 *Description of the Entomostraca of the Pleistocene Beds of Newbury, Copford, Clacton, and Grays:* Ann. Mag. Nat. Hist. ser. 2, vol. 6, pp. 25-28, pl. 3.
1856 *Notes on the Entomostraca of the Headon and Osborne series:* Memoirs, Geol. Survey, X (not seen).
1857 *A Monograph of the Tertiary Entomostraca* of England: Palaeont. Soc. London, 68 pp., 6 pls.
1885 *On the Ostracoda of the Purbeck formation; with notes on the Wealden species:* Geol. Soc. London Quart. Jour., vol. 41, pp. 311-353, pls. 8, 9.
1889 (and Sherborn, C. D.) *A supplementary monograph of the Tertiary Entomostraca of England:* Palaeont. Soc. London, pp. 1-55, 3 pls.
1893 *On some fossil Ostracoda from southwest Wyoming, and from Utah, U.S.A.:* Geol. Mag., vol. 10, pp. 385-391, pl. 15.

Klie, W.
1929 *Beitrag zur Kenntnis der Ostracoden der sudlichen und westlichen Ostsee, der festlandischen Nordseekueste und der Insel Helgolund:* Zeitschr. Wiss. Zool. Leipzig vol. 134, pp. 270-306.

Knight, J. B. (see Moore)

Law, J. (see Howe, 1936)

LeRoy, L. W.
1941 *The Ostracode genus Cytherelloidea from the Tertiary of the Netherlands East Indies:* Jour. Paleontology, vol. 15, pp. 612-641.
1943 *Pleistocene and Pliocene Ostracoda of the coastal region of southern California:* Jour. Paleontology, vol. 17, pp. 354-373.

Martin, G. P.
1940 *Ostracoden des norddeutschen Purbeck und Wealden:* Senckenbergiana, vol. 22, pp. 275-361.

Méhes, G.
1941 *Die Ostracoden des Oberoligozäns der Umgebung von Budapest:* Geol. Hungarica ser. Palaeontologica, vol. 16.

Mincher, Albert R.
1941 *The fauna of the Pascagoula formation:* Jour. Paleontology, vol. 15, pp. 337-348, pls. 46, 47, 1 table.
Monsour, E.
1937 *Micropaleontologic analysis of Jackson Eocene of eastern Mississippi:* Am. Assoc. Petroleum Geologists Bull., vol. 21, pp. 80-96, 1 fig.
Moore, R. C.
1942 (and Weller, J. M., and Knight, J. B.) *Erroneous emendation of generic names:* Jour. Paleontology, vol. 16, pp. 250-261.
Moreman, W. L.
1927 *Fossil zones of the Eagle Ford of north Texas:* Jour. Paleontology, vol. 1, pp. 89-101, pls. 13-16.
Morrow, A. L.
1934 *Foraminifera and Ostracoda from the Upper Cretaceous of Kansas:* Jour. Paleontology, vol. 8, pp. 186-205.
Müller, G. W.
1894 *Fauna und Flora des Golfes von Neaple:* Zool. Station Naple, Mon. 21, pp. viii, 404, 40 pls.
1906 *Ostracoda in: Wissenschaftlicht Ergebnisse der deutschen Tiefsee-expedition:* vol. 8, Lief. 2, pp. 29-154, pls. 5-35.
1912 *Das Tierreich, L. 31, Ostracoda:* pp. i-xxxiii, 1-434, 92 pls.
Münster, G.
1830 *Uber einige fossile Arten Cypris und Cythere:* Jahrb. für Mineral. Geog. Geol. Petrefackt, p. 63.
Murray, G. E., Jr.
1942 (and Hussey, K. M.) *Some Tertiary Ostracoda of the genera Alatacythere and Brachycythere:* Jour. Paleontology, vol. 16, pp. 164-182, pls. 27, 28.
Neviani, A.
1928 *Ostracodi fossili d'italia.* I. *Vallebiaja (Calabriano):* Mem. Acad. Nuovi, Lincei (2), vol. 11, pp. 1-120, 2 pls.
Norman, A. M. (see also Brady, 1889 and 1896)
1862 *On species of Ostracoda found in Northumberland and Durham, new to Great Britain:* Tyneside Nat. Field Club Trans., vol. 5, pp. 143-151, pl. 3.
(1865) 1867 *Report on the Crustacea dredged off the coasts of Northumberland and Durham,* 1862-1864: in Nat. History Trans., Northumberland and Durham, vol. 1, pp. 12-29, pls. 5-7.
Ponton, G. M. (see Cushman, 1932)
Puri, Harbans S.
1952a *Ostracode genera Cytheretta and Paracytheretta in America:* Jour. Paleontology, vol. 26, pp. 199-212, pls. 39, 40; 16 text figs., 1 table, 2 charts.
1952b *Ostracode genus Cytherideis and its Allies:* Jour. Paleontology, vol. 26, pp. 902-914, pls. 130, 131, 14 text figs., 1 table, 1 chart.
1953a *The Ostracode genus Trachylebris and its ally Actinocythereis:* Am. Midland Naturalist, vol. 49, no. 1, pp. 171-187, 2 pls., text figs. A-G.
1953b *The Ostracode genus Hemicythere and its Allies:* Jour. Washington Acad. Sci., vol. 43, no. 6, pp. 169-179, 2 pls.
1953c Taxonomic comment on: "*Ostracoda from wells in North Carolina,* Part I: *Cenozoic Ostracoda*" by F. M. Swain: Jour. Paleontology, vol. 27, pp. 750-752.
Ruggieri, G.
1950 *Gli Ostracodi delle sabbie grige Quaternarie (Milazziano) di Imola,* Part I: Giornale de Geologia (Bologna), ser. 2, vol. 21 (1949), pp. 1-58, pl. 1, 34 text figs.
1952 *Nota preliminare sugli Ostracodi di alcune spiaggie adriatiche:* Note del Laboratorio di Biologia marina di Fano (Bologna), vol. 1, no. 8, pp. 57-64, 4 text figs.
1952 *Gli Ostracodi delle sabbie grige Quarternarie (Milazziano) di Imola,* Part II: Giornale di Geologia (Bologna), ser. 2, vol. 22 (1950), pp. 58-115, 9 pls.

Sars, G. O.
1865 (1866) *Oversigt af Norges marine Ostracoder: Vidensk selsk.* Oslo (Christiania) Forh., pp. 1-130.
1922-1928 *An account of the Crustacea of Norway,* Bergen Museum, Bergen, Norway, vol. 9 Crustacea, in 16 parts, 1 and 2 (1922); 3, 4 (1923); 5-12 (1925); 13-14 (1926); 15-16 (1928), 227 pp., 119 pls.

Schmidt, R. A. M.
1948 *Ostracoda from the Upper Cretaceous and Lower Eocene of Maryland, Delaware,* and *Virginia:* Jour. Paleontology, vol. 22, pp. 389-431.

Sexton, James V.
1951 *The Ostracode Cytherelloidea in North America:* Jour. Paleontology, vol. 25, pp. 808-816, pls. 115-117.

Sherborn, C. D. (see Jones, 1889)

Skogsberg, Tage
1928 *Studies on marine Ostracoda,* Part II. Occasional Papers California Acad. Sci., vol. 15, pp. 1-154, 6 pls., 23 figs.

Smith, R. H.
1941 *Micropaleontology and stratigraphy of a deep well at Niceville, Okaloosa County, Florida:* Am. Assoc. Petroleum Geologists Bull., vol. 25, pp. 263-286, 3 figs., 2 pls.

Sohn, I. G.
1951 *Check list of salinity tolerance of post-Paleozoic fossil Ostracoda:* Jour. Washington Acad. Sci., vol. 41, no. 2, pp. 64-66.

Stadnichenko, Maria M.
1927 *The Foraminifera and Ostracods of the marine Yegua of the type sections:* Jour. Paleontology, vol. 1, pp. 221-243, pls. 38, 39.

Stephenson, M. B.
1935 *Some microfossils of the Potamides matsoni zone:* Louisiana Geol. Survey Bull. 6, pp. 187-196.
1938 *Miocene and Pliocene Ostracoda of the genus Cytheridea from Florida:* Jour. Paleontology, vol. 12, pp. 127-148, pls. 23, 24.
1941 *Notes on the subgenera of the Ostracode genus Cytheridea:* Jour. Paleontology, vol. 15, pp. 424-429, 20 text figs.
1943 *Haplocytheridea bassleri Stephenson, new name for Cytheridea subovata Ulrich and Bassler:* Jour. Paleontology, vol. 17, pp. 206-207.
1944 *New Ostracoda from subsurface middle Tertiary strata of Texas:* Jour. Paleontology, vol. 18, pp. 156-161, pl. 28.
1946 *Weches Eocene Ostracoda from Smithville, Texas:* Jour. Paleontology, vol. 20, pp. 297-344, pls. 42-45.

Sutton, A. H.
1939 (and Williams, J. R.) *Ostracoda from the Weches formation at Smithville, Texas:* Jour. Paleontology, vol. 13, pp. 569, 570, pl. 64, figs. 26-28.
1940 *New name for Weches Ostracoda:* Jour. Paleontology, vol. 14, p. 163.

Swain, F. M.
1946 *Ostracoda from the Tertiary of Florida:* Jour. Paleontology, vol. 20, pp. 374-383, pls. 54-55.
1948 *Ostracoda from the Hammond well in Cretaceous and Tertiary subsurface geology:* Maryland Dept. Geol. Mines, and Water Res., vol. 71, pp. 187-213, pls. 12-14.
1949 *Upper Jurassic of northeastern Texas:* Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 1206-1250.
1951 *Ostracoda from wells in North Carolina,* Part I. *Cenozoic Ostracoda:* U. S. Geol. Survey Prof. Paper 234-A, 58 pp., 7 pls., 3 text figs.

Terquem, M. O.
1878 *Les Foraminiferes et les Entomostracés-Ostracodes du Pliocene supérieur de l'Isle de Rhodes:* Geol. Soc. France, Mem., ser. 3, vol. 1, pp. 81-135, pls. 10-14.

Tressler, Willis L.
1941 *Geology and Biology of north Atlantic deep-sea cores between*

Newfoundland and Ireland, IV, Ostracoda: U. S. Geol. Survey Prof. Paper 196-C, pp. 96-104, pl. 19.

Triebel, E.
1952 *Ostracoden der Gattung Cytheretta aus dem Tertiär des Mainzer Beckens:* Notizbl. hess. L.-Amt. Bodenforsch, ser. 6, vol. 3, pp. 15-30, pls. 2-5.

Ulrich, E. O.
1904 (and Bassler, R. S.) *Systematic paleontology of the Miocene deposits of Maryland, Ostracoda:* pp. 98-130, pl. 35-38.

Van den Bold, W. A.
1946 *Contribution to the study of Ostracoda with special reference to the Tertiary and Cretaceous microfauna of the Caribbean region:* Amsterdam, 167 pp., 18 pls.
1950 *Miocene Ostracoda from Venezuela:* Jour. Paleontology, vol. 24, pp. 76-88.

Vanderpool, H. C.
1933 *Upper Tertiary microfossils from southern Oklahoma:* Jour. Paleontology, vol. 7, pp. 406-411.

Van Keen, J. E.
1936 *Die Cytherellidae der Maastrichter Tuffreide und das Kunrader Korallenkalkes von Sud-Limburg:* Geol.-mijnb. genootsch. Nederland en Kolonien Verh., Geol. Ser., Dl, 9.

Weingeist, Leo.
1949 *The Ostracoda genus Eucytherura and its species from the Cretaceous and Tertiary of the Gulf Coast:* Jour. Paleontology, vol. 23, pp. 364-379, pl. 73.

Weller, J. M. (see Moore, 1942)

Williams, J. R. (see Sutton, 1939).

PLATES 1 - 17

Explanation of Plate 1

All figures approximately X40. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1—*Bairdia laevicula* Edwards, locality no. 27, plesiotype no. 2487, right valve view of a complete carapace.

2—*Bairdia chipolensis* Puri, n. sp., locality no. 12, holotype no. 2488, right valve of a complete carapace.

3, 4—*Bairdoppilata triangulata* Edwards, locality no. 43. 3, plesiotype no. 2489, a right valve; 4, plesiotype no. 2490, a left valve.

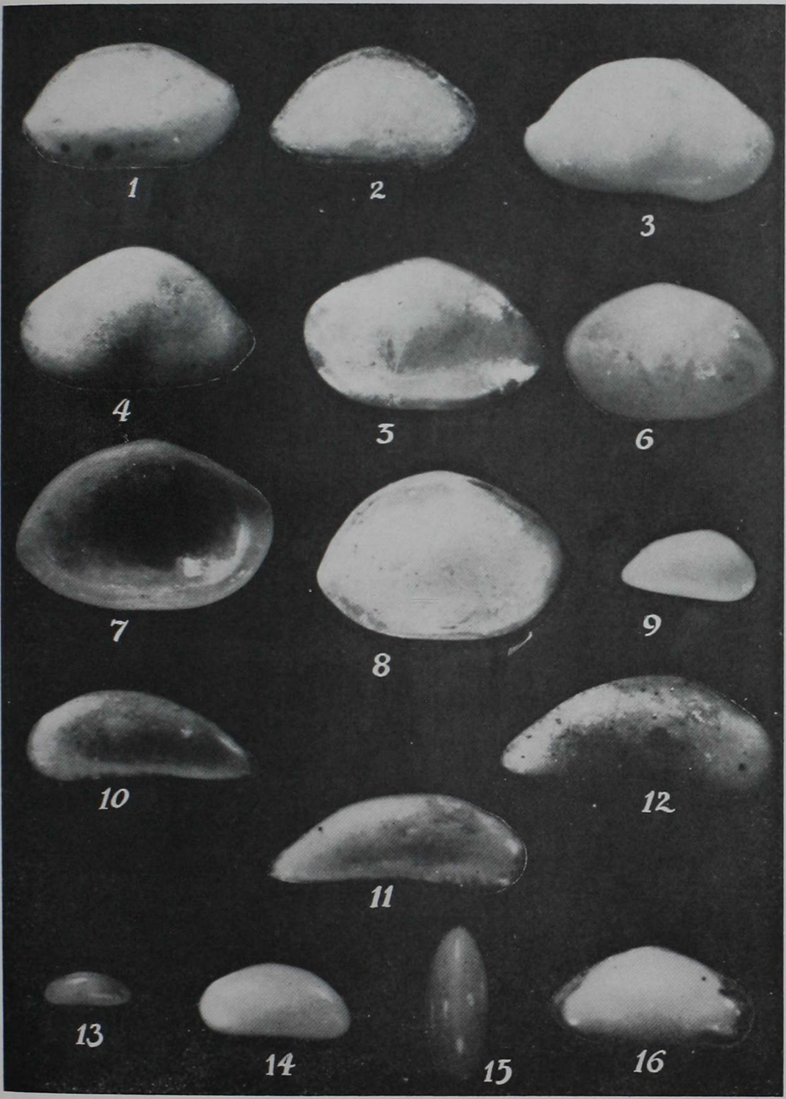
5, 6, 7, 8—*Bairdoppilata willisensis* Puri, n. sp., locality no. 4. 5, holotype no. 2491, a left valve; 6, paratype no. 2492, a left valve; 7, paratype no. 2493, a left valve; 8, paratype no. 2494, a complete carapace.

9—*Paracypris chipolensis* Puri, n. sp., locality no. 3, holotype no. 2495, right valve view of a complete carapace.

10, 11, 12—*Paracypris choctawhatcheensis* Puri, n. sp. 10, paratype no. 2496, a left valve, locality no. 52; 11, paratype no. 2497, a right valve, locality no. 52; 12, holotype no. 2498, right valve view of a complete carapace, locality no. 44.

13—*Bythocypris minuta* Puri, n. sp., locality no. 1, holotype no. 2499, left valve view of a complete carapace.

14, 15, 16—*Bythocypris howei* Puri, n. sp. 14, paratype no. 2653, a left valve, locality no. 43; 15, holotype no. 2654, dorsal view of a complete carapace, locality no. 43; 16, paratype no. 2655, right valve view of a complete carapace, locality no. 44.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Explanation of Plate 2

All figures approximately X40. Type numbers refer to the Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2—*Haplocytheridea chipolensis* (Stephenson), locality no. 12. 1, plesiotype no. 2656, a left valve; 2, plesiotype no. 2657, a right valve.

3, 4, 5—*Haplocytheridea choctawhatcheensis* (Howe and Stephenson), locality no. 35. 3, plesiotype no. 2658, a right valve; 4, plesiotype no. 2659, a left valve; 5, plesiotype no. 2660, a right valve.

6, 7, 8—*Haplocytheridea waltonensis* (Stephenson), locality no. 18. 6, plesiotype no. 2661, a left valve; 7, plesiotype no. 2662, a left valve; 8, plesiotype no. 2663, a right valve.

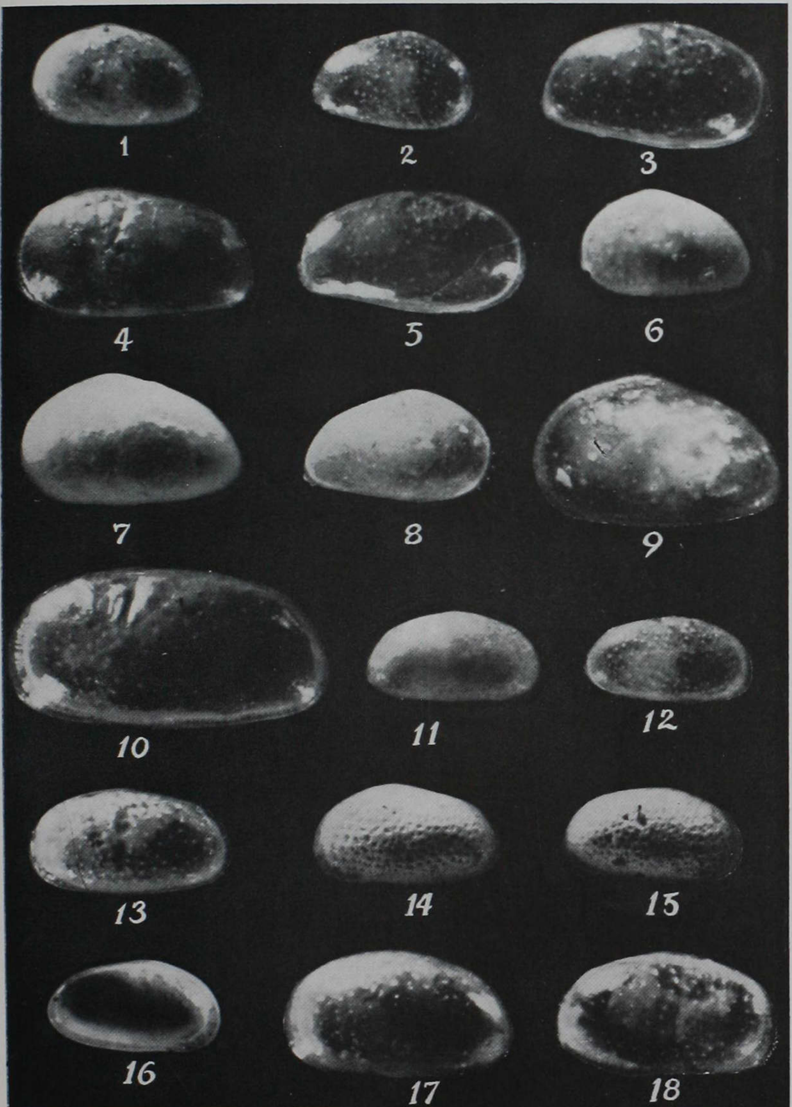
9—*Haplocytheridea okaloosensis* (Stephenson), locality no. 16, plesiotype no. 2664, a left valve.

10—*Anomocytheridea floridana* (Howe and Hough), locality no. 35, plesiotype no. 2665, a left valve.

11, 12, 13—*Haplocytheridea mansfieldi* (Stephenson), locality no. 12. 11, plesiotype no. 2667, a right valve; 12, plesiotype no. 2668, a right valve; 13, plesiotype no. 2669, a left valve.

14, 15, 16—*Haplocytheridea gardnerae* (Stephenson), locality no. 6. 14, plesiotype no. 2670, a left valve; 15, plesiotype no. 2671, a right valve; 16, plesiotype no. 2672, a left valve.

17, 18—*Haplocytheridea* cf. *H. proboscidiala* (Edwards), locality no. 48. 17, plesiotype no. 2673, a left valve; 18, plesiotype no. 2674, a right valve.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Explanation of Plate 3

All figures approximately X40. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2, 3, 4—*Haplocytheridea bassleri* Stephenson.
1, plesiotype no. 2675, a right valve from locality no. 24; 2, plesiotype no. 2676, a left valve from locality no. 24; 3, plesiotype no. 2677, a left valve from locality no. 24; 4, plesiotype no. 2678, a complete carapace from locality no. 17.

5, 6—*Haplocytheridea wadei* Stephenson. 5, plesiotype no. 2680, a right valve from locality no. 42; 6, plesiotype no. 2681, a complete carapace from locality no. 43.

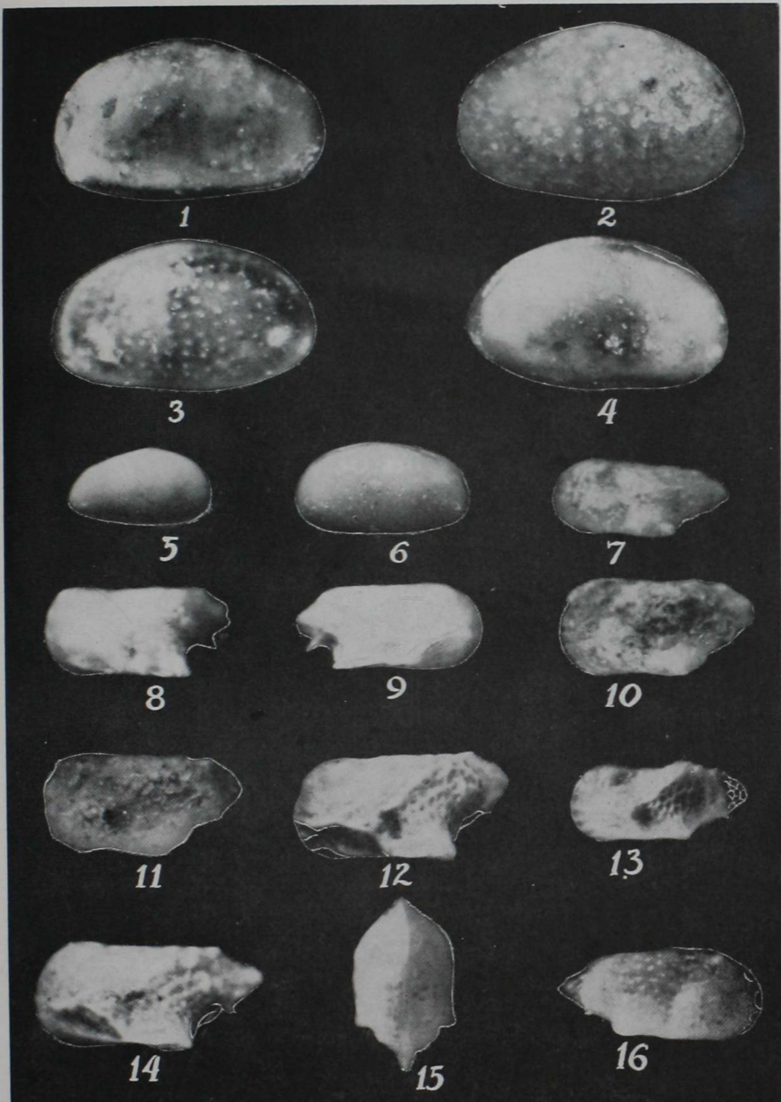
7—*Paracytheridea vandenboldi* Puri, locality no. 24, plesiotype no. 2684, a left valve.

8, 9—*Paracytheridea shoalriverensis* Puri, n. sp., locality no. 17. 8, holotype no. 2685, a left valve; 9, paratype no. 2686, a right valve.

10, 11—*Paracytheridea washingtonensis* Puri, n. sp., locality no. 37. 10, holotype no. 2687, a left valve; 11, paratype no. 2688, a left valve.

12, 13, 14—*Paracytheridea chipolensis* Howe and Stephenson, locality no. 1. 12, plesiotype no. 2689, a left valve; 13, plesiotype no. 2690, a left valve; 14, plesiotype no. 2691, a left valve.

15, 16—*Paracytheridea altila* Edwards, locality no. 58. 15, plesiotype no. 2692, a complete carapace; 16, plesiotype no. 2693, a right valve.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Explanation of Plate 4

All figures approximately X60. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2, 3, 4—*Cytherura wardensis* Howe and Brown. 1, plesiotype no. 2695, right valve view of a complete carapace, locality no. 44; 2, plesiotype no. 2696, dorsal view of a complete carapace, locality no. 43; 3, right valve view of the same specimen; 4, plesiotype no. 2697, left valve view of a complete carapace, locality no. 43.

5, 6—*Kangarina jacksonbluffensis* Puri, n. sp. locality no. 44. 5, holotype no. 2698, right valve view of a complete carapace; 6, paratype no. 2699, a left valve.

7—*Kangarina howei* Puri, n. sp., holotype no. 2700, a right valve, locality no. 44.

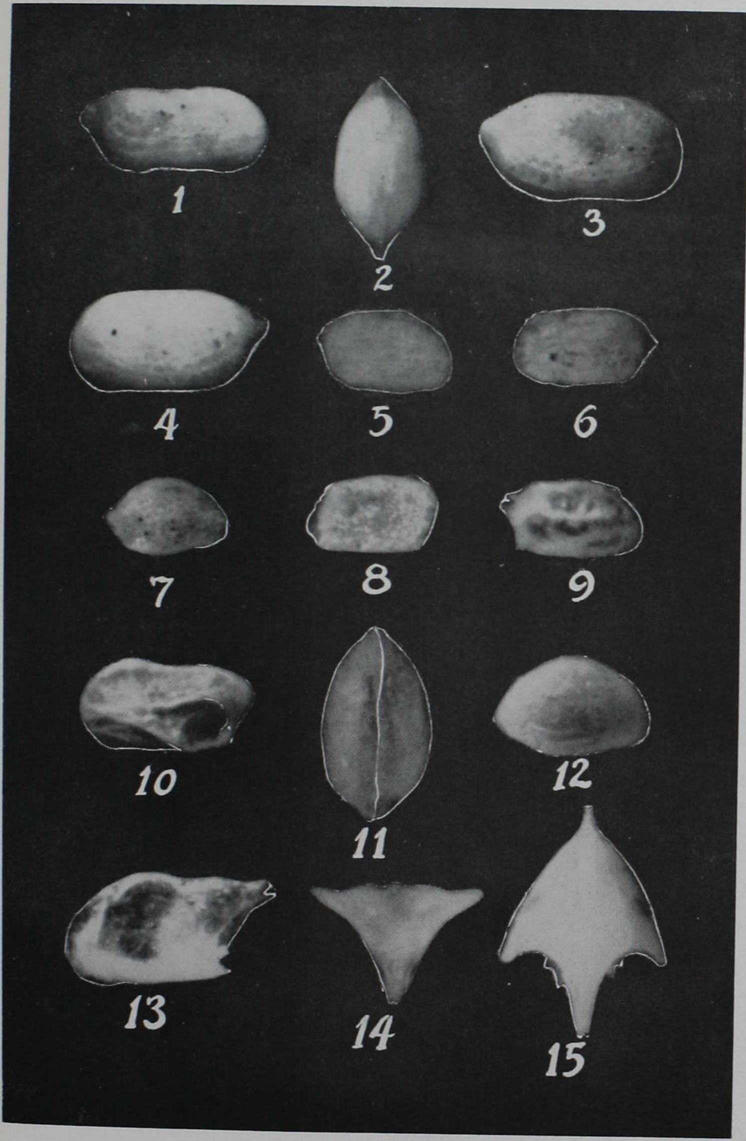
8—*Eucytherura weingeisti* Puri, n. sp., holotype no. 2701, a left valve from locality no. 30.

9—*Kangarina quellita* Coryell and Fields, plesiotype no. 2702, a right valve, locality no. 52.

10—*Kangarina chipolensis* Puri, n. sp.,holotype no. 2703, a left valve, locality no. 1.

11, 12—*Cytheropteron leonensis* Puri, n. sp. 11, holotype no. 2704, dorsal view of a complete carapace, locality no. 44; 12, paratype no. 2705, a right valve, locality no. 48.

13, 14, 15—*Cytheropteron coryelli* Puri, n. sp. 13, holotype no. 2706, a left valve, locality no. 53; 14, paratype no. 2707, posterior view of a complete carapace, locality no. 58; 15, dorsal view of the same specimen.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Explanation of Plate 5

All figures approximately X60. Type numbers refer to the Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

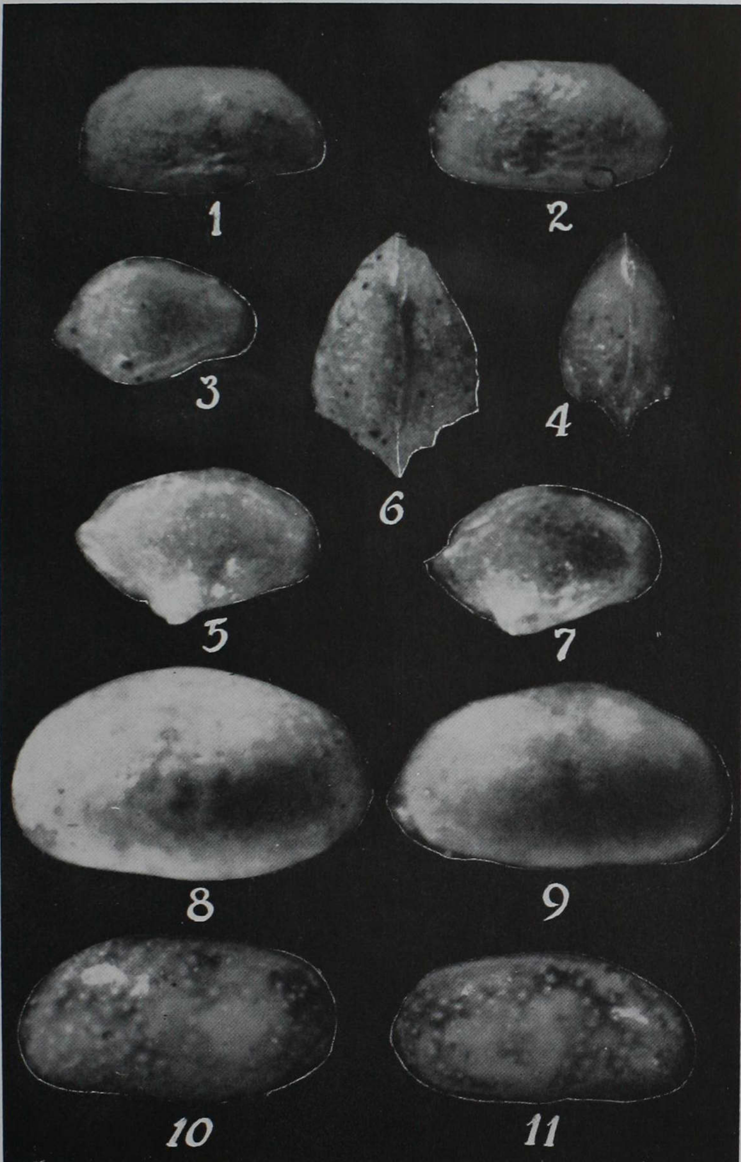
1, 2—*Cytheropteron choctawhatcheensis* Puri, n. sp., locality no. 44. 1, holotype no. 2708, a left valve; 2, paratype no. 2709, a left valve.

3, 4—*Cytheropteron wardensis* Puri, n. sp., locality no. 44. 3, holotype no. 2710, a right valve; 4, paratype no. 2711, dorsal view of a complete specimen.

5, 6, 7—*Cytheropteron talquinensis* Puri, n. sp., locality no. 44. 5, paratype no. 2712, a right valve; 6, holotype no. 2713, dorsal view of a complete specimen; 7, right valve view of the same specimen.

8, 9—*Cythere apalachicolensis* Puri, n. sp., locality no. 52. 8 holotype no. 2714, a left valve; 9, paratype no. 2715, a right valve.

10, 11—*Cythere redbayensis* Puri, n. sp., locality no. 24. 10, holotype no. 2716, a left valve; 11, paratype no. 2717, a right valve.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Explanation of Plate 6

All figures approximately X40. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

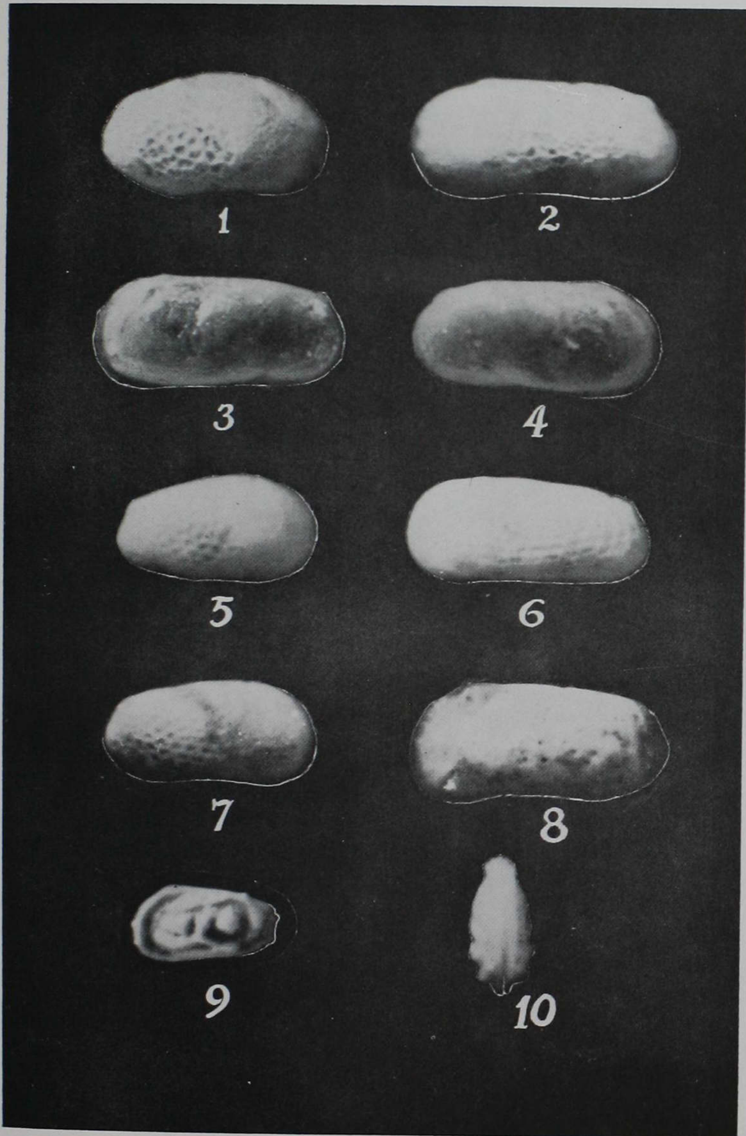
1, 2—*Cytheromorpha warneri okaloosensis* Howe and Spurgeon, locality no. 17. 1, paratype no. 2719, a right valve; 2, paratype no. 2743, left valve view of a complete carapace.

3, 4—*Cytheromorpha laevigata* Puri, n. sp., locality no. 32. 3, holotype no. 2746, a left valve; 4, paratype no. 2747, a right valve.

5, 6, 7—*Cytheromorpha warneri* Howe and Spurgeon, locality no. 42. 5, plesiotype no. 2748, a right valve; 6, plesiotype no. 2749, a left valve; 7, plesiotype no. 2750, a right valve.

8—*Cytheromorpha dalli* (Howe and Brown), locality no. 16, plesiotype no. 2745, a left valve.

9, 10—*Cytheromorpha subminuta* Puri, n. sp., locality no. 43. 9, holotype no. 2751, a left valve; 10, paratype no. 2752, a complete carapace.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Explanation of Plate 7

All figures X40. Specimen numbers refer to the Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2—*Cytheretta burnsi* (Ulrich and Bassler), locality no. 26. 1, plesiotype no. 974, left valve; 2, plesiotype no. 975, right valve.

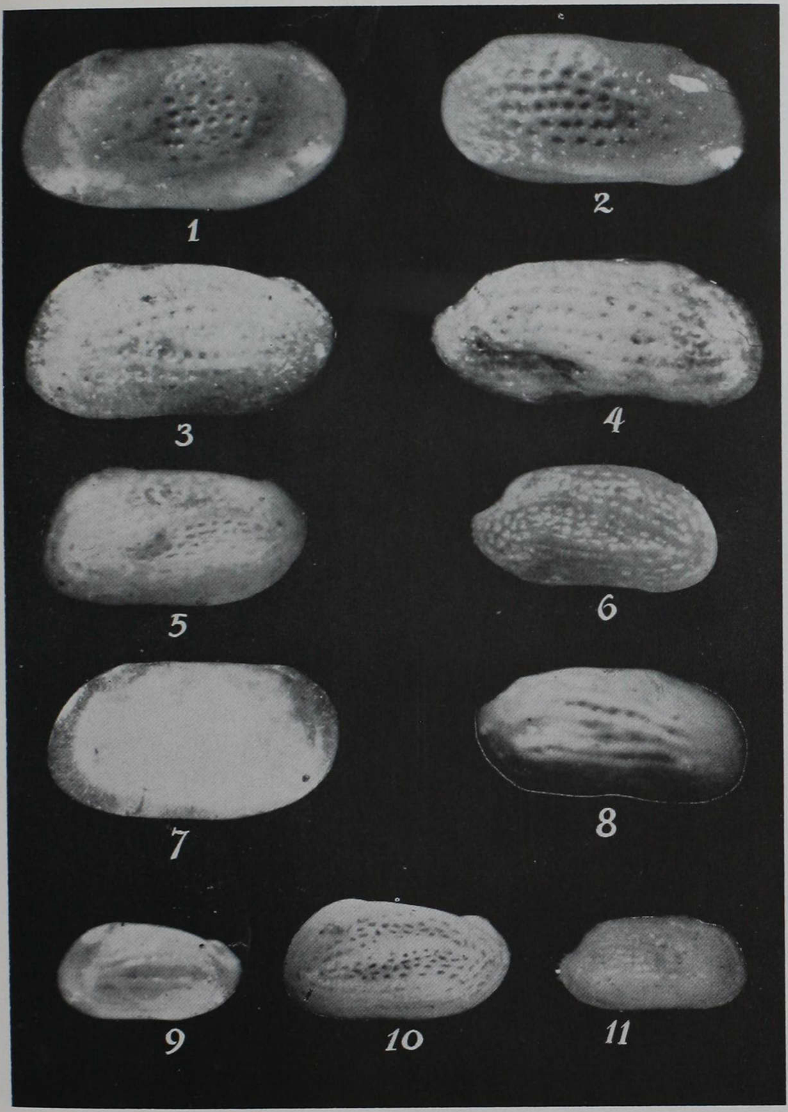
3, 4—*Cytheretta gardneri* Smith, locality no. 16. 3, topotype no. 982, left valve; 4, topotype no. 983, right valve.

5, 6—*Cytheretta karlana* Howe and Pyeatt, locality no. 17. 5, plesiotype no. 984, left valve; 6, plesiotype no. 985, right valve.

7—*Cytheretta spencerensis* Smith, locality no. 21, cotype no. 2872, left valve.

8, 9—*Cytheretta calhounensis* Smith. 8, plesiotype no. 995, a right valve from locality no. 1; 9, plesiotype no. 996, a left valve from locality no. 12.

10, 11—*Cytheretta choctawhatcheensis* Howe and Taylor. 10, plesiotype no. 991, a left valve from locality no. 1; 11, plesiotype no. 990, a right valve from locality no. 24.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Explanation of Plate 8

All figures X40. Specimen numbers refer to the Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2—*Cytheretta dali* Smith, locality no. 15. 1, cotype no. 2863, left valve; 2, cotype no. 2861, right valve.

3, 4—*Cytheretta okaloosensis* Smith, locality no. 15. 3, cotype no. 2871, right valve; 4, cotype no. 2870, left valve.

5, 6—*Cytheretta bassleri* Howe, locality no. 24. 5, plesiotype no. 980, left valve; 6, plesiotype no. 979, right valve.

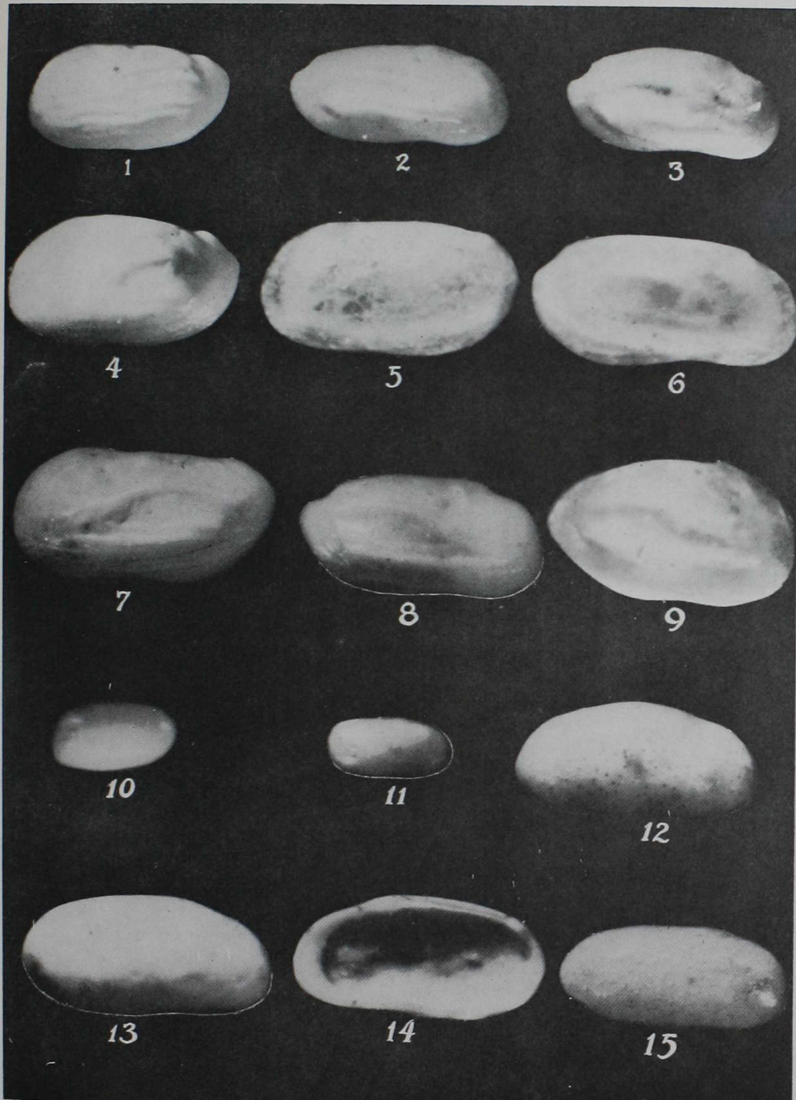
7, 8—*Cytheretta sahnii* Puri, locality no. 41. 7, holotype no. 976, left valve; 8, paratype no. 977, right valve.

9—*Cytheretta inaequivalvis* (Ulrich and Bassler), locality no. 17, plesiotype no. 978, right valve.

10, 11—*Basslerites miocenica* Howe, locality no. 41. 10, plesiotype no. 2753, right valve; 11, plesiotype no. 2754, right valve.

12—*Basslerites* cf. *B. giganticus* Edwards, locality no. 42, plesiotype no. 2755, a right valve.

13, 14, 15—*Basslerites tenmilecreekensis* Puri, n. sp. 13, holotype no. 2756, a right valve from locality no. 12; 14, internal view of same specimen; 15, paratype no. 2757, right valve from locality no. 12.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Explanation of Plate 9

All figures X45. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2, 3—*Cytherideis agricola* Howe and Hadley. 1, plesiotype no. 2450, a left valve from locality no. 24; 2, plesiotype no. 2451, a right valve from locality no. 24; 3, plesiotype no. 2453, a right valve from locality no. 17.

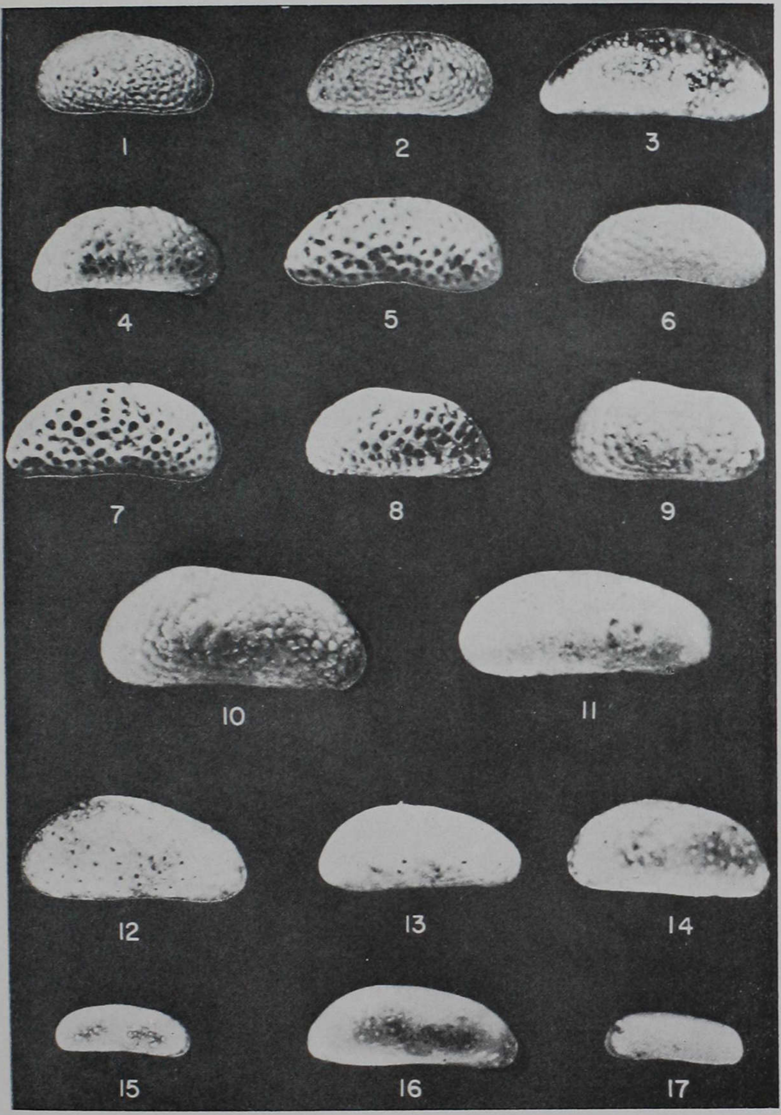
4, 5, 6, 7, 8—*Cytherideis ashermani* Ulrich and Bassler. 4, plesiotype no. 2445, a right valve from locality no. 10; 5, plesiotype no. 2446, a right valve from locality no. 15; 6, plesiotype no. 2448, a right valve from locality no. 42; 7, plesiotype no. 2447, a right valve from locality no. 15; 8, plesiotype no. 2449, a right valve from locality no. 10.

9, 10—*Cytherideis wilberti* Puri. 9, cotype no. 2443, a left valve from locality no. 10; 10, cotype no. 2444, a left valve from locality no. 10.

11, 12, 13—*Cytherideis ulrichi* Howe and Johnson. 11, plesiotype no. 2456, a left valve from locality no. 24; 12, plesiotype no. 2457, a left valve from locality no. 16; 13, plesiotype no. 2458, a left valve from locality no. 16.

14—*Cytherideis fabula* Howe and Dohm, plesiotype no. 2454, a left valve from locality no. 24.

15, 16, 17—*Cytherideis anderseni* Puri. 15, cotype no. 2439, a right valve from locality no. 11; 16, cotype no. 2440, a right valve from locality no. 10; 17, cotype no. 2441, a left valve from locality no. 24.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Explanation to Plate 10

All figures approximately X60. Specimen numbers refer to Henry V. Howe Collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2—*Loxoconcha wilberti* Puri, n. sp., locality no. 30. 1, holotype no. 2758, a right valve; 2, paratype no. 2759, a left valve.

3—*Loxoconcha alumbluffensis* Puri, n. sp., locality no. 52, holotype no. 2760, a left valve.

4—*Loxoconcha anderseni* Puri, n. sp., locality no. 1, holotype no. 2761, left valve view of a complete carapace.

5, 6—*Loxoconcha doryandae* Puri, n. sp., locality no. 52. 5, paratype no. 2763, a right valve; 6, holotype no. 2762, a left valve.

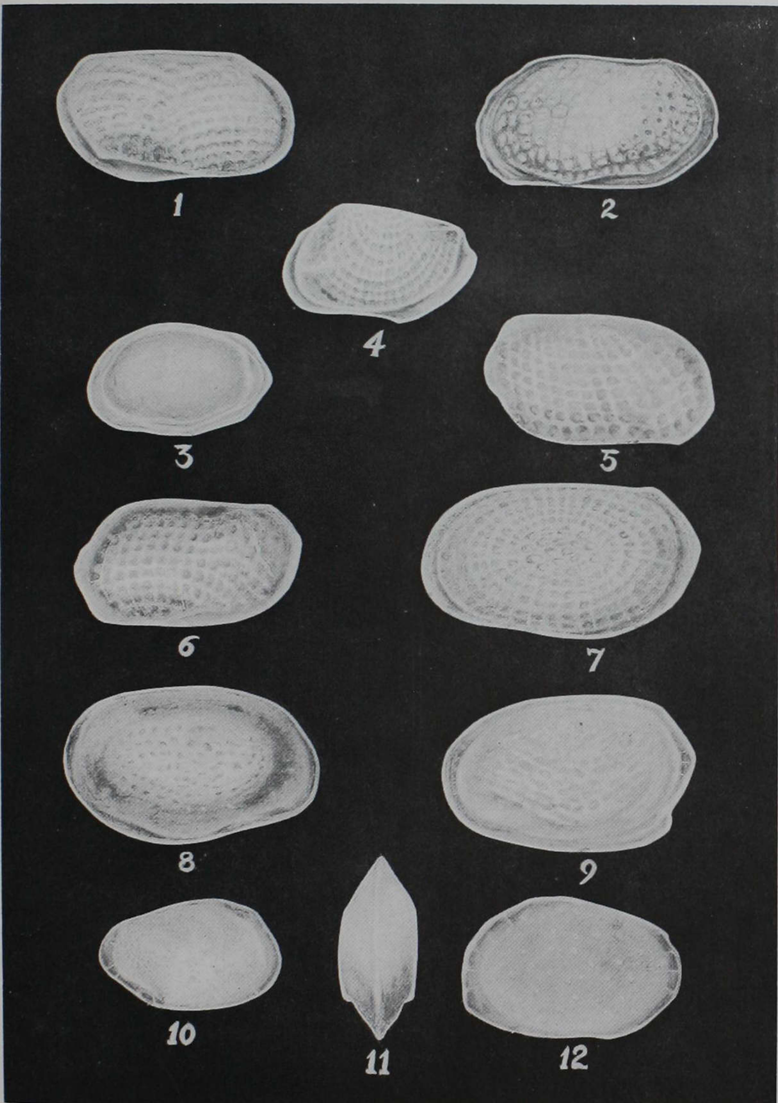
7—*Loxoconcha reticularis* Edwards, locality no. 42, plesiotype no. 2764, a left valve.

8—*Loxoconcha purisubrhomboidea* Edwards, locality no. 44, plesiotype no. 2765, a right valve.

9—*Loxoconcha caudata* Puri, n. sp., locality no. 37, holotype no. 2766, left valve view of a complete carapace.

10, 11—*Loxoconcha hendryi* Puri, n. sp. 10, holotype no. 2767, a right valve from locality no. 24; 11, paratype no. 2768, dorsal view of a complete carapace from locality no. 30.

12—*Loxoconcha chipolensis* Puri, n. sp., locality no. 12, holotype no. 2769, a left valve.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Explanation of Plate 11

All figures approximately X40. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2—*Rectotrachyleberis* cf. *R. triplistriata* Edwards. 1, plesiotype no. 2770, a right valve view, locality no. 42; 2, plesiotype no. 2771, a right valve view, locality no. 43.

3, 4, 5, 6, 7—*Cativella navis* Coryell and Fields. 3, plesiotype no. 2772, a right valve, locality no. 50; 4, plesiotype no. 2773, right valve view of a complete specimen, locality no. 50; 5, plesiotype no. 2774, left valve view of a complete specimen, locality no. 50; 6, plesiotype no. 2775, right valve view of a complete specimen, locality no. 43; 7, plesiotype no. 2776, right valve view of a complete specimen, locality no. 43.

8, 9—*Hermania reticulata* Puri, n. gen., n. sp., locality no. 1. 8, holotype no. 2777, a right valve; 9, paratype no. 2778, ventral view of a complete specimen.

10, 11, 12—*Hemicythere confragosa* Edwards. 10, plesiotype no. 2470, left valve view of a complete specimen, locality no. 42; 11, plesiotype no. 2471, dorsal view of complete specimen, locality no. 42; 12, plesiotype no. 2472, a left valve, locality no. 43.

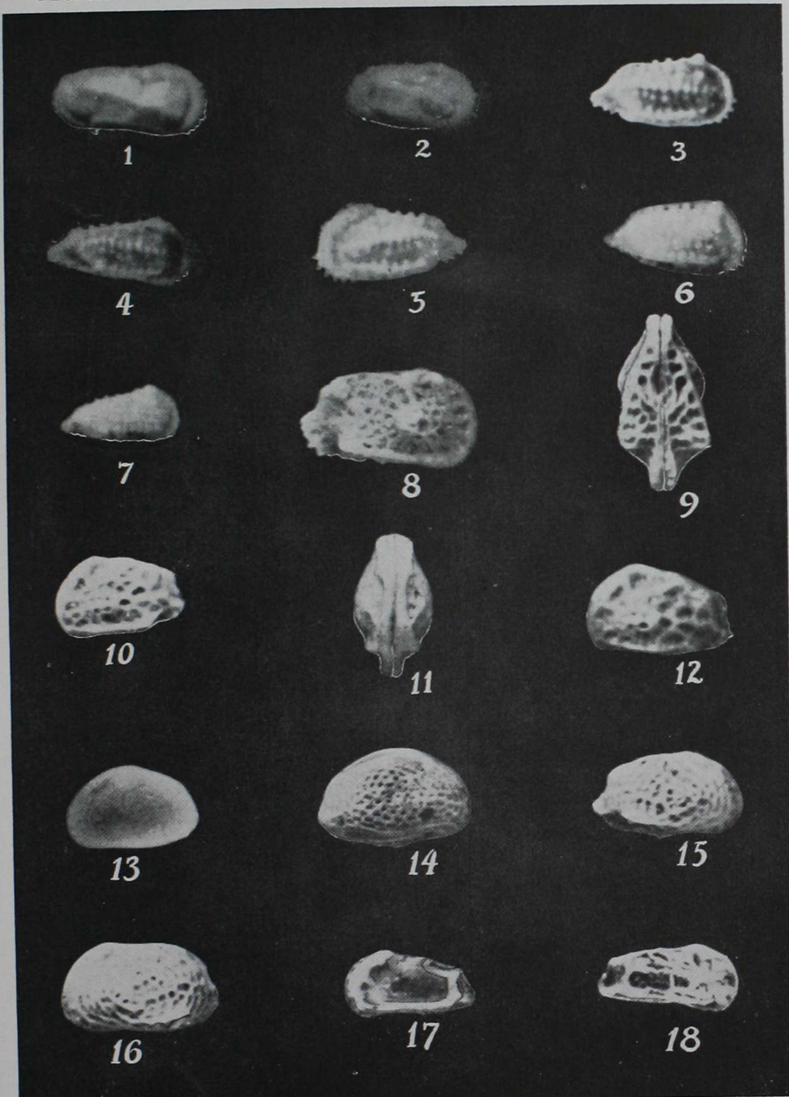
13—*Hemicythere laevicula* Edwards, locality no. 42, plesiotype no. 2467, a left valve.

14—*Hemicythere amygdala* Stephenson, locality no. 1, plesiotype no. 2469, right valve view of a complete specimen.

15, 16—*Procythereis calhounensis* (Smith), locality no. 1. 15, plesiotype no. 2487, a right valve; 16, plesiotype no. 2485, a left valve.

17—*Caudites sellardsi* (Howe and Neill), locality no. 24, plesiotype no. 2482, left valve view of a complete specimen.

18—*Caudites chipolensis* Puri, locality no. 6, paratype no. 2484, a right valve.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Explanation of Plate 12

All figures X45. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1—*Echinocythereis evax* (Ulrich and Bassler), locality no. 42, plesiotype no. 2779, a left valve.

2, 3, 4, 5—*Echinocythereis garretti* (Howe and McGuirt). 2, plesiotype no. 2780, a left valve, locality no. 43; 3, plesiotype no. 2781, a right valve, locality no. 44; 4, plesiotype no. 2782, a right valve, locality no. 42; 5, plesiotype no. 2783, a left valve, locality no. 42.

6, 7, 8—*Murrayina gunteri* (Howe and Chambers). 6, plesiotype no. 2784, a right valve, locality no. 33; 7, plesiotype no. 2785, a left valve, locality no. 33; 8, plesiotype no. 2786, a left valve, locality no. 16.

9, 10—*Murrayina howei* Puri, n. name, locality no. 33. 9, plesiotype no. 2787, a left valve; 10, plesiotype no. 2788, a right valve.

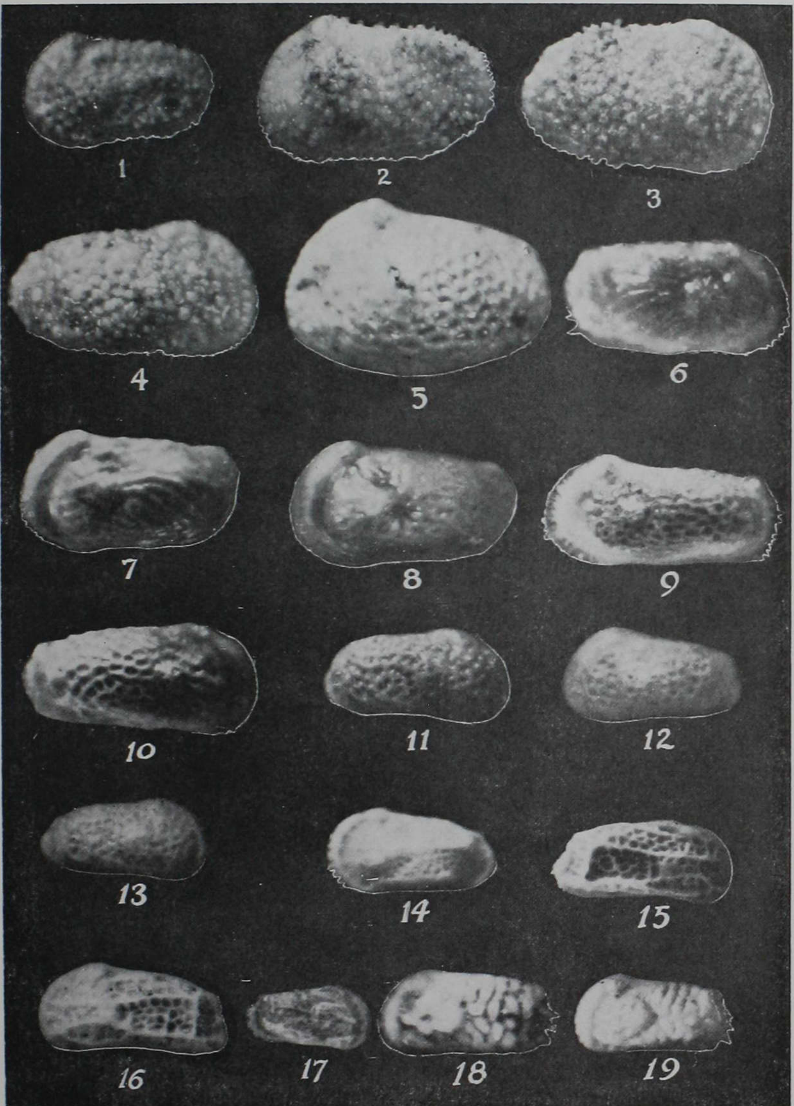
11, 12, 13—*Murrayina martini* (Ulrich and Bassler), locality no. 42. 11, plesiotype no. 2789, a right valve; 12, plesiotype no. 2790, a left valve; 13, plesiotype no. 2791, a right valve.

14—*Orionina lienenklausi* (Ulrich and Bassler), locality no. 42, plesiotype no. 2792, a left valve.

15, 16—*Orionina vaughani* (Ulrich and Bassler). 15, plesiotype no. 2793, a right valve, locality no. 1; 16, plesiotype no. 2794, a left valve, locality no. 42.

17—*Puriana puella* (Coryell and Fields), locality no. 42, plesiotype no. 2796, a right valve.

18, 19—*Puriana rugipunctata* (Ulrich and Bassler). 18, plesiotype no. 2797, a left valve, locality no. 24; 19, plesiotype no. 2798, a left valve, locality no. 42.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Explanation of Plate 13

All figures X45. Specimen numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

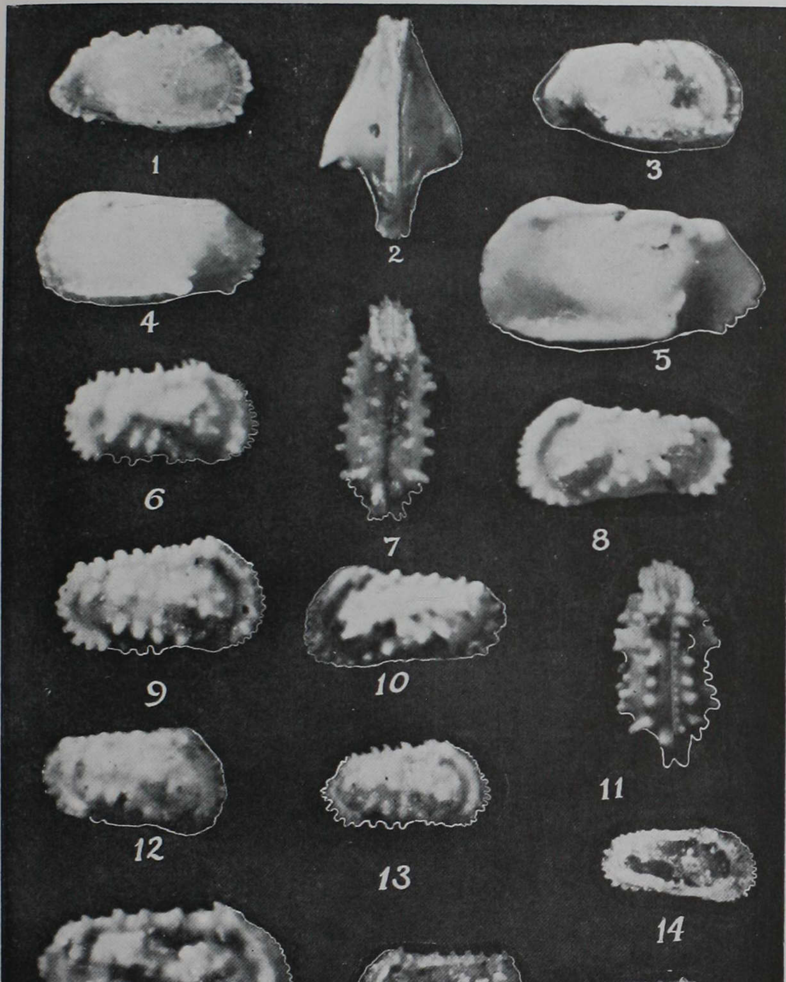
Figures

1, 2, 3, 4, 5—*Pterygocythereis cornuta americana* (Ulrich and Bassler). 1, plesiotype no. 2799, a right valve, locality no. 12; 2, plesiotype no. 2800, dorsal view of a complete carapace, locality no. 52; 3, plesiotype no. 3016, a right valve, locality no. 17; 4, plesiotype no. 3017, a left valve, locality no. 52; 5, plesiotype no. 3018, a left valve, locality no. 1.

6, 7, 8, 9, 10, 11, 12, 13—*Actinocythereis exanthemata* (Ulrich and Bassler). 6, plesiotype no. 2427, a right valve, locality no. 42; 7, plesiotype no. 2429, dorsal view of a complete specimen, locality no. 42; 8, plesiotype no. 2428, a left valve, locality no. 1; 9, plesiotype no. 3019, a right valve, locality no. 1; 10, plesiotype no. 3020, left valve view of a complete carapace, locality no. 17; 11, plesiotype no. 3021, dorsal view of a complete carapace, locality no. 1; 12, plesiotype no. 3022, right valve view of a complete carapace, locality no. 17; 13, plesiotype no. 3023, a right valve, locality no. 12.

14, 15—*Actinocythereis exanthemata marylandica* (Howe and Hough). 14, plesiotype no. 3024, a right valve, locality no. 42; 15, plesiotype no. 2420, a right valve, locality no. 24.

16, 17—*Actinocythereis exanthemata gomillionensis* (Howe and Ellis). 16, plesiotype no. 3026, a left valve, locality no. 58; 17, plesiotype no. 3027, a right valve, locality no. 52.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Explanation to Plate 14

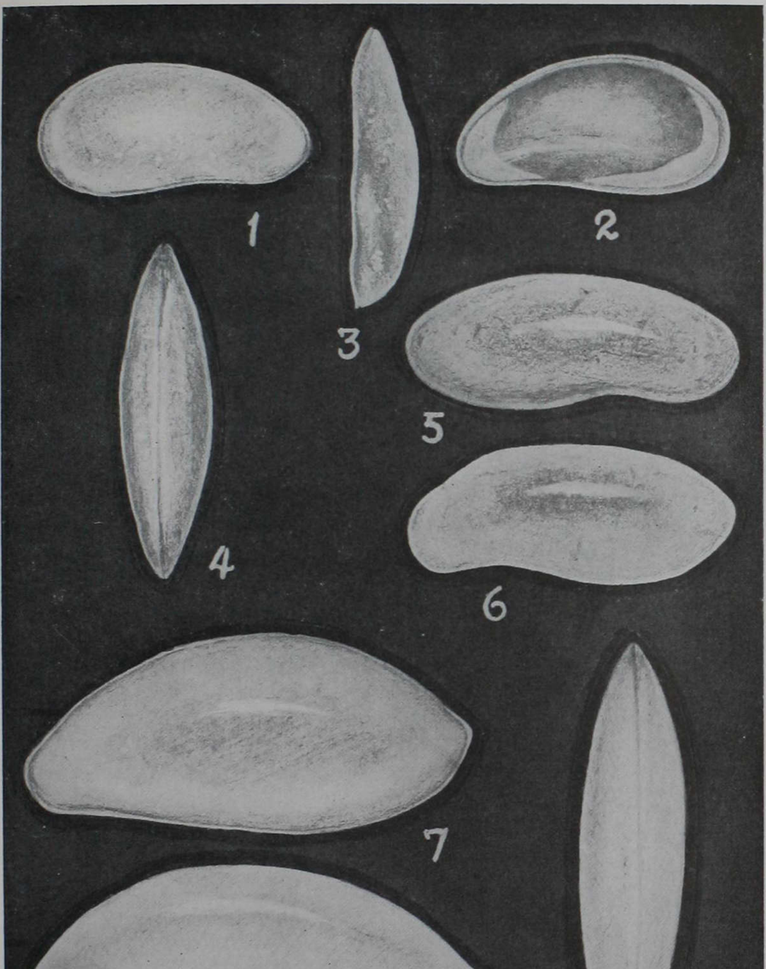
All figures approximately X100. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2, 3—*Paradoxostoma* (?) *delicata* Puri, n. sp., locality no. 58, holotype no. 3033, a right valve. 1, side view; 2, dorsal view; 3, inside view.

4, 5, 6—*Paradoxostoma elongata* Puri, n. sp., locality no. 43, holotype no. 3032, a complete carapace. 4, dorsal view; 5, right valve view; 6, left valve view.

7, 8, 9—*Paradoxostoma robusta* Puri, n. sp., locality no. 44, holotype no. 3031, a complete carapace. 7, left valve view; 8, right valve view; 9, dorsal view.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Explanation to Plate 15

All figures approximately X60. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1—*Paradoxostoma robusta* Puri, n. sp., locality no. 44, holotype no. 3031, left valve view of a complete carapace.

2—*Paradoxostoma elongata* Puri, n. sp., locality no. 43, holotype no. 3032, left valve view of a complete carapace.

3—*Paradoxostoma* (?) *delicata* Puri, n. sp., locality no. 58, holotype no. 3033, a right valve.

4—*Pellucistoma magniventra* Edwards, locality no. 52, plesiotype no. 3034, a left valve.

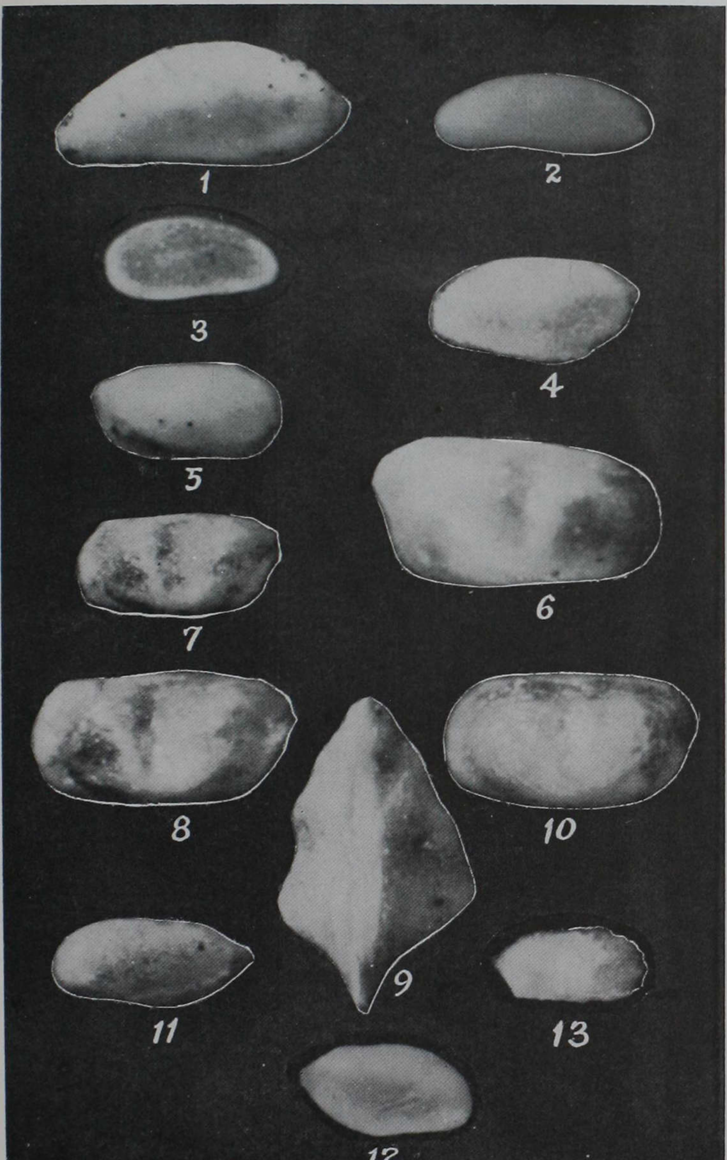
5—*Pellucistoma tumida* Puri, n. sp., locality no. 43, holotype no. 3035, right valve view of a complete carapace.

6, 7, 8, 9, 10—*Monoceratina bifurcata* Puri, n. sp. 6, paratype no. 3036, a right valve from locality no. 2; 7, paratype no. 3037, a left valve from locality no. 12; 8, paratype no. 3038, a left valve from locality no. 12; 9, holotype no. 3039, dorsal view of a complete carapace from locality no. 1; 10, paratype no. 3040, a left valve from locality no. 48.

11—*Luvula howei* Puri, n. sp., locality no. 12, holotype no. 3041, a left valve.

12—*Luvula palmerae* Coryell and Fields, locality no. 30, plesiotype no. 3042, right valve view of a complete carapace.

13—*Luvula moccasinensis* Puri, n. sp., locality no. 52, holotype no. 3043, a right valve.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Explanation to Plate 16

All figures approximately X60. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2, 3, 4—*Xestoleberis triangularis* Puri, n. sp., locality no. 39. 1, holotype no. 3047, left valve view of a complete carapace; 2, paratype no. 3048, a right valve view of a complete carapace; 3, paratype no. 3049, dorsal view of a complete carapace; 4, paratype no. 3050, dorsal view of a complete carapace.

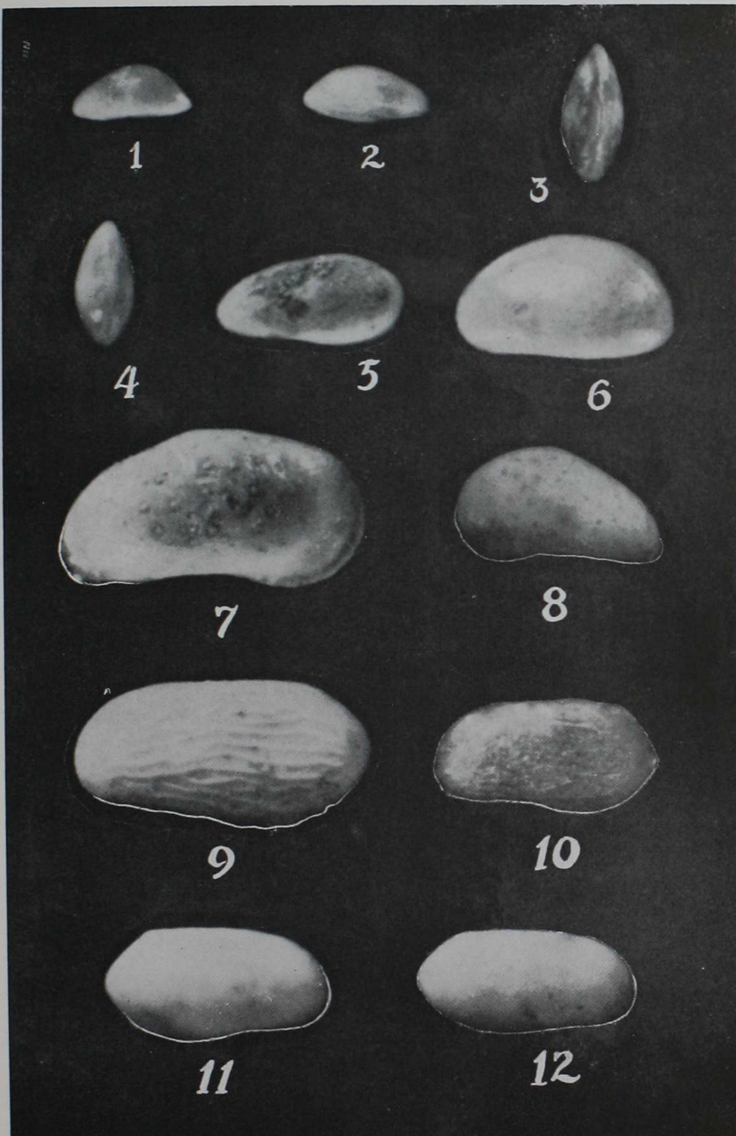
5—*Xestoleberis miocenicus* Puri, n. sp., locality no. 53, holotype no. 3051, a right valve.

6—*Xestoleberis choctawhatcheensis* Puri, n. sp., locality no. 42, holotype no. 3052, a left valve.

7, 8—*Eucythere triangulata* Puri, n. sp. 7, holotype no. 3053, a right valve from locality no. 42; 8, paratype no. 3054, a left valve from locality no. 24.

9, 10—*Microcythere striata* Puri, n. sp. 9, holotype no. 3055, left valve view of a complete carapace from locality no. 1; 10, paratype no. 3056, a left valve from locality no. 12.

11, 12—*Microcythere stephensoni* Puri, n. sp. 11, holotype no. 3057, a right valve from locality no. 42; 12, paratype no. 3058, right valve view of a complete carapace from locality no. 44.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Explanation to Plate 17

All figures approximately X60. Type numbers refer to Henry V. Howe collection, Louisiana State University, Baton Rouge, La.

Figures

1, 2—*Cytherelloidea moccasinensis* Sexton. 1, plesiotype no. 3059, a left valve, from locality no. 58; 2, plesiotype no. 3060, a left valve, from locality no. 52.

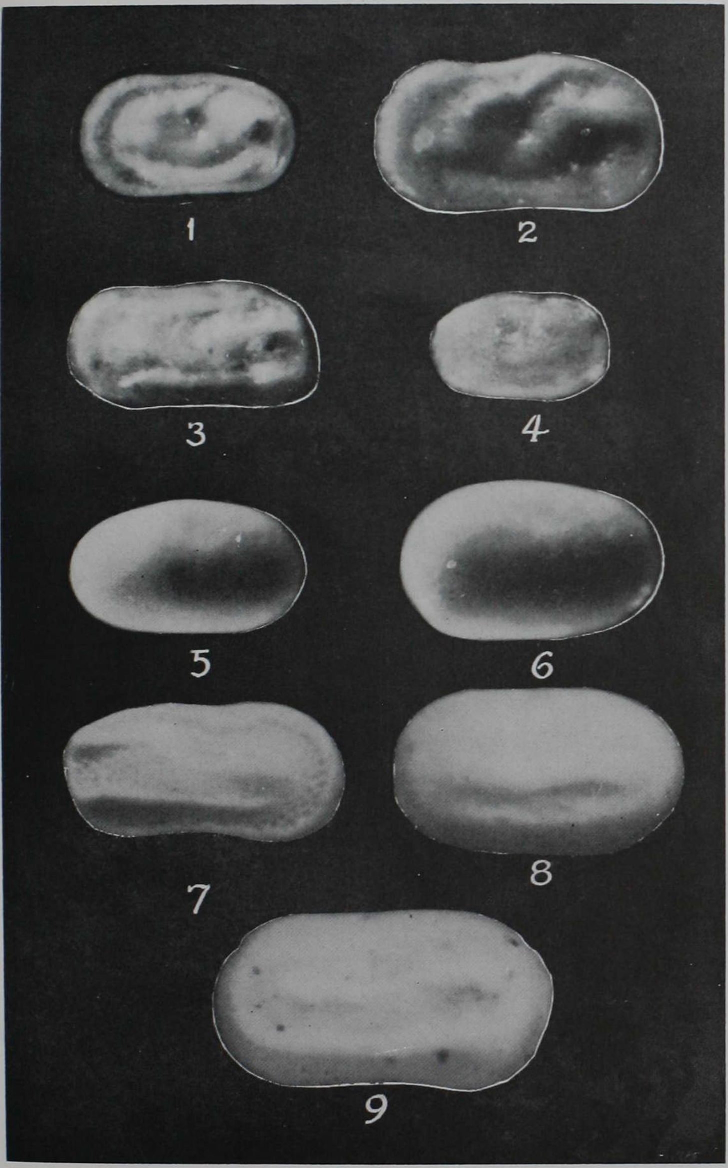
3—*Cytherelloidea leonensis* Howe, plesiotype no. 3062, a left valve, from locality no. 44.

4—*Platella gatunensis* Coryell and Fields, plesiotype no. 3044, a right valve from locality no. 48.

5, 6—*Cytherella chipolensis* Puri, n. sp., locality no. 8. 5, paratype no. 3045, a left valve; 6, holotype no. 3046, a right valve.

7—*Cytherelloidea umbonata* Edwards, a right valve from locality no. 1.

8, 9—*Cytherelloidea vernoni* Sexton. 8, a left valve from locality no. 1; 9, a left valve from locality no. 3.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