

**STATE OF FLORIDA
STATE BOARD OF CONSERVATION
DIVISION OF GEOLOGY**

FLORIDA GEOLOGICAL SURVEY

Robert O. Vernon, Director

GEOLOGICAL BULLETIN NO. 43

**NEOGENE BIOSTRATIGRAPHY
OF THE
CHARLOTTE HARBOR AREA
IN
SOUTHWESTERN FLORIDA**

**By
Jules R. DuBar
University of Houston**

**Published for
THE FLORIDA GEOLOGICAL SURVEY**

TALLAHASSEE

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LETTER OF TRANSMITTAL



Florida Geological Survey

Tallahassee

November 15, 1961

Honorable Farris Bryant, *Chairman*
Florida State Board of Conservation
Tallahassee, Florida

Dear Governor Bryant:

The Florida Geological Survey is publishing a paper on the stratigraphy and paleontology of the Charlotte Harbor area, as Florida Geological Survey Bulletin No. 43. This report is entitled, "Neogene Biostratigraphy of the Charlotte Harbor Area in Southwestern Florida," and was prepared by Dr. Jules R. DuBar, Professor of Geology, University of Houston.

The report presents added data that will relate to the full understanding of the difficult stratigraphic and paleontologic problems of southern Florida. Part of a successful search for oil is contingent upon a fuller understanding of these formations.

Respectfully yours,

Robert O. Vernon,
Director and State Geologist

Completed manuscript received

March 1961

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TABLE OF CONTENTS

	Page
Introduction	1
Location and description of area	1
Present investigation	1
History of previous work	4
Acknowledgments	5
Stratigraphy	5
General statement	5
Stratigraphy along Shell Creek	7
General statement	7
Tamiami Formation	7
Distribution	7
Lithology and fossils	7
Thickness	7
Caloosahatchee Marl	10
General statement	10
Distribution	10
Lithology	10
Contacts	10
Thickness	10
Structure	10
Stratal units	11
Lower limestone (Unit A)	11
Lower marl (Unit B)	11
Middle limestone (Unit C)	12
Middle marl (Unit D)	12
Upper limestone (Unit E)	13
Upper marl (Unit F)	14
Fort Thompson Formation	15
Stratigraphy along Alligator Creek	16
General statement	16
Tamiami Formation	17
Distribution	17
Lithology and fossils	17
Thickness	17
Caloosahatchee Marl	17
Distribution	17
Lithology	17
Thickness	17
Contacts	18
Fort Thompson Formation	18
Distribution	18
Lithology and fossils	18
Thickness	18
Stratigraphy south of Alligator Creek	18
Stratigraphy at Warm Mineral Springs	19
Paleoecology	20
General discussion	20
Tamiami Formation	20
Caloosahatchee Marl	21
General discussion	21
Shell Creek	22

	Page
Lower limestone (Unit A)	22
Lower marl (Unit B)	23
Middle limestone (Unit C)	24
Middle marl (Unit D)	24
Upper limestone (Unit E)	27
Upper marl (Unit F)	28
Alligator Creek	32
Fort Thompson Formation	35
General statement	35
Station D-20	36
Station D-7	37
Warm Mineral Springs	38
Acline fauna	39
Bibliography	45
Appendix	49
Stratigraphic sections	49
Megafossil check list, Charlotte Harbor Area, Florida	60
Ostracode check list from the Caloosahatchee marl on Shell Creek, Charlotte County, Florida	82
Foraminiferal check list for the Shell Creek Caloosahatchee marl	83

ILLUSTRATIONS

Figure	Page
1 Location of area studied	2
2 Principal geographic features of the Charlotte Harbor area	3
3 Generalized columnar section for the Shell Creek area	8
4 Location of measured sections and localities	9
5 Section SC-8 on Shell Creek	12
6 Ledge of upper Caloosahatchee limestone (Unit E) exposed along Shell Creek at Station SC-5	13
7 The upper shell marl (Unit F) at station SC-1	15
8 Station SC-1 in the Karnes Shell Pit near Shell Creek	16

Plate

I Correlation of measured sections on Shell Creek, Florida	In pocket
II Correlation of measured sections on Alligator Creek, Florida	In pocket

Table

	Page
1 Classification of Neogene formations exposed in the Charlotte Harbor, Florida area	6
2 Most abundant molluscan species in Unit D of the Caloosahatchee Marl on Shell Creek	25
3 Most abundant molluscan species in Unit F of the Caloosahatchee Marl on Shell Creek	29
4 Molluscan fauna collected off the coast of Texas at a depth of 54 feet (Hulings, 1955)	31
5 Most abundant molluscan species in the Caloosahatchee Marl on Alligator Creek	33
6 Most abundant molluscan species in the Fort Thompson Formation at station D-20	37
7 Check list of molluscan species from Warm Mineral Springs, Sarasota County, Florida	38
8 Acline molluscan check list	40

NEOGENE BIOSTRATIGRAPHY OF THE CHARLOTTE HARBOR AREA IN SOUTHWESTERN FLORIDA

By
JULES R. DuBAR

INTRODUCTION

LOCATION AND DESCRIPTION OF AREA

The investigated area is located, with the exception of one locality in southern Sarasota County, in Charlotte County along the east shore of Charlotte Harbor (fig. 1, 2).

North or south access to the area is gained by U.S. Highway 41. From the east the area can be reached by U.S. Highway 70 or U.S. Highway 80.

All the surface lies below an elevation of 50 feet above sea level. Drainage is southward and westward into Charlotte Harbor principally by Peace River and its tributaries. Alligator Creek flows into the harbor near Acline a few miles south of Punta Gorda, and the southern part of the area is drained by the Caloosahatchee River which reaches the gulf opposite the southern tip of Pine Island.

According to Parker and Cooke (1944, pl. 8) the area is a part of the "Sandy Flatlands," which they have described as "lowlying, defectively drained lands, generally flat though parts on higher terraces are gently rolling."

PRESENT INVESTIGATION

The aim of this report is to present a stratigraphic and paleoecological analysis of the Neogene deposits exposed in the vicinity of Charlotte Harbor in Florida. Information derived from this study added to that from earlier studies of the Caloosahatchee River area (DuBar, 1958c) makes possible an accurate interpretation of the depositional environments and geologic history for an important part of the Neogene of southwestern Florida.

Field work related to this study was conducted during parts of the summers of 1953 and 1958 while employed by the Florida Geological Survey. Special attention was given the excellent exposures on Shell Creek; however, all other known exposures in Charlotte County, including those on Alligator Creek, were visited. All exposures were measured and sectioned, and approximately 1,200 pounds of sediments and fossils were collected from more than 20 localities.

In the laboratory, sediments were studied with the aid of a binocular microscope, and insoluble residue analyses were made of the limestone units exposed along Shell Creek. The faunas were analyzed stratigraphically and ecologically with special emphasis being placed on the mollusks, which in all collections constituted the largest part of the fauna.

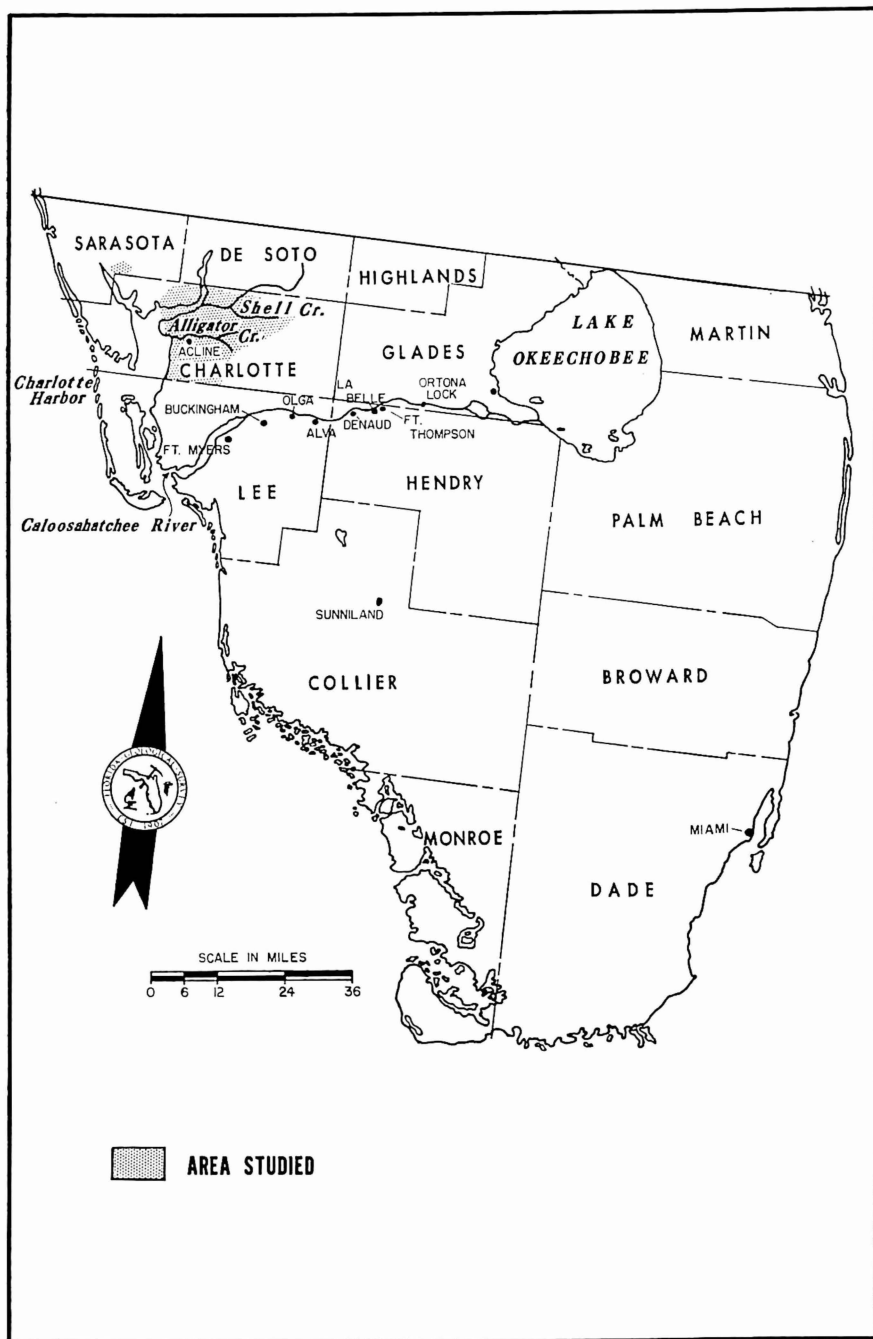
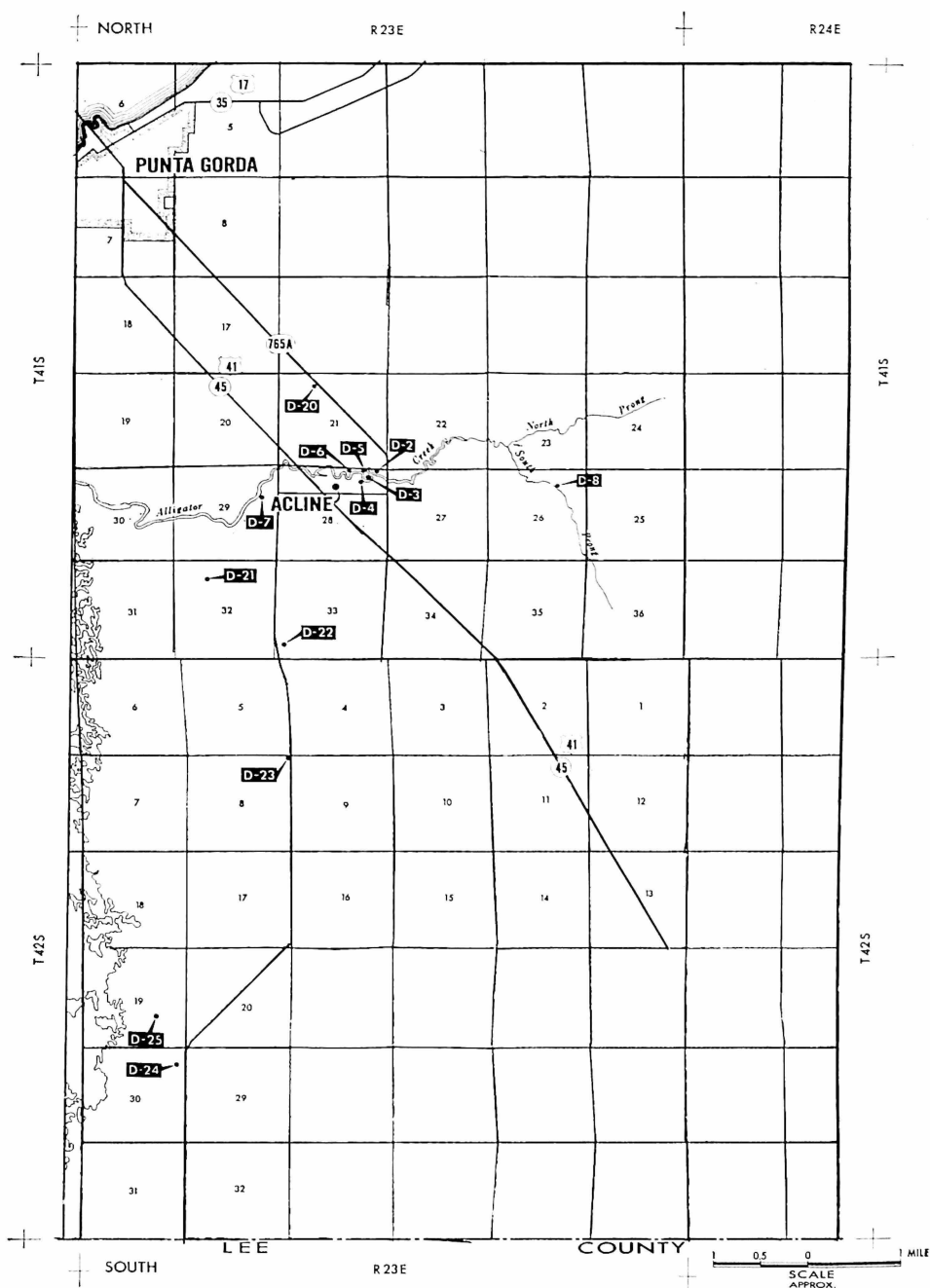


Figure 1. Location of area studied.



In addition, collections made by H. H. Winters from Warm Mineral Springs, and by Charles Locklin from Acline, were studied and are discussed in this report.

HISTORY OF PREVIOUS WORK

Apparently the earliest geological work in Charlotte County was done about 1890 or 1891 by Joseph Willcox, William Healy Dall, and Frank Burns (Dall and Harris, 1892; Dall, 1890-1903). These men recognized the Caloosahatchee Marl on Alligator and Shell creeks, and Myakka River. Their collections of fossil species were listed, figured, and described by Dall (1890-1903) in his monograph on the Tertiary of Florida.

Matson and Clapp (1909) showed, on a geologic map of Florida, exposures of the Caloosahatchee Marl on Shell and Alligator creeks.

Tucker and Wilson (1932-33) described a molluscan fauna collected from the spoil piles along a pit located near Acline. This fauna contained several new species, some with Caribbean affinities and was judged to be possibly late Miocene in age.

Geologic and Pleistocene shoreline maps prepared by Parker and Cooke (1944) included Charlotte County, but were very generalized.

In his "Geology of Florida" Cooke (1945) very briefly mentioned Charlotte County and his geologic map of the state showed the supposed general distribution of Neogene deposits in Charlotte County.

F. S. MacNeil (1950) listed several species of megafossils collected from Tamiami and Caloosahatchee exposures located on or near Alligator Creek.

A monograph of Caloosahatchee mollusks was published by Olsson and Harbison (1953) in which several new species were described from Shell Creek.

A geologic map of southern Florida prepared by Parker, et al., (1955) was similar to that of Parker and Cooke (1944), but classified the Tamiami Formation as Miocene in age and indicates the formation is represented in southern Charlotte County by two facies.

Schroeder, Klein, and Hoy (1958) published a geologic map of southern Florida which is the most detailed yet for Charlotte County. They apparently were the first geologists to recognize the presence of the Tamiami Formation on Shell Creek.

DuBar (1958a) briefly mentioned exposures on Alligator and Shell creeks and (1958c) presented a general discussion of the Neogene stratigraphy of southwestern Florida.

The "Summary of the Geology of Florida and a Guidebook to the Classic Exposures" (Puri and Vernon, 1959) includes a composite stratigraphic section (p. 203-205) for Shell Creek, which was prepared by DuBar.

ACKNOWLEDGMENTS

The Florida Geological Survey, initially under the direction of Dr. Herman Gunter and later under the direction of Dr. Robert O. Vernon, paid the field expenses related to this study. The Survey also supplied two able field assistants, Mr. Roy Staton, who aided the writer in 1953, and Mr. V. V. Vanstrum, who assisted in 1958.

At the National Museum, Neogene megafossil collections and laboratory facilities were made available by Dr. Harold Rehder and Mr. Druid Wilson. Foraminiferal assemblages from two localities were studied and identified by Mrs. Gene Ross Kellough of the Geology Department at the University of Houston.

The manuscript was typed by Mrs. Phyllis DuBar and Mrs. Ohma Bow, secretary to the Geology Department at the University of Houston. The illustrations were prepared by Mr. Harry Whitehead, draftsman with the Florida Geological Survey, from rough copy.

STRATIGRAPHY

GENERAL STATEMENT

Beds older than Late Miocene are not shown to crop out in southwestern Florida. In the Charlotte Harbor area the Late Miocene is represented by the Tamiami Formation; Pliocene deposits are unknown and the Pleistocene is represented by the Caloosahatchee Marl and the overlying Fort Thompson Formation. All of the formations are typically unconsolidated, being comprised mainly of soft marls, clay, sands, and shell remains. The maximum combined thickness of the Pleistocene formations is probably less than 75 feet and the average is probably less than 25 feet. Thickness of the Tamiami Formation has not been determined inasmuch as its base has not been observed. At all places where contacts were observed, it was seen that the Caloosahatchee Marl rests unconformably on the Tamiami Formation and is, in turn, unconformably overlain by the Fort Thompson Formation. The best exposures occur along Shell and Alligator creeks in the northern part of Charlotte County. Other exposures are rare and offer little opportunity for study of lateral variation. All exposures studied occur below the 30-foot contour and thus are probably located below the Pamlico shoreline (25-30 feet above sea level).

The ages of the formations included in this investigation have been discussed in considerable detail in earlier papers by DuBar (1958a, 1958b, 1958c, 1959) and by others; Mansfield, 1939; Parker, et al., 1955; Parker and Cooke, 1944; Puri and Vernon, 1959; Richards, 1938, 1945, 1959; and Schroeder, Klein, and Hoy, 1958. Evidence derived from the present study for the most part tends to corroborate the writer's previous observations.

The Fort Thompson Formation as used in this report is judged to be contemporaneous with the Fort Thompson Formation of the Caloosahatchee River area, which has been shown to merge eastward with sediments placed in the Anastasia Formation by Parker, et al., (1955).

The Anastasia Formation is a distinct lithologic unit composed of whole and broken mollusk shells, associated microfaunas, and quartz sand. These sediments compose the coquina of Anastasia Island, Flagler County, a shell hash or coarse carbonate clastic mixed with quartz sand. It is proposed that the Anastasia Formation be restricted to this distinct lithologic type and Fort Thompson Formation be applied to the series of shell marls, clays, and sands, as described in this report. The Fort Thompson deposits stratigraphically overlie the Caloosahatchee Marl and are either exposed at the surface or are overlain by a thin layer of relatively recent soils and sands. All marine sediments that have been assigned to the Fort Thompson Formation lie below a surface elevation of 25 feet above sea level; however, nonmarine equivalents are known to occur at higher elevations.

The classification of Neogene formations of southwestern Florida as used in this report appears in table 1 below.

TABLE 1. Classification of Neogene Formations Exposed in the Charlotte Harbor, Florida, Area

	Stages	Formations
Pleistocene	Recent	Thin surficial sands and alluvium
	Wisconsinan	No record
	Bradyan	Fort Thompson Formation
	Iowan	No record
	Sangamonian	Caloosahatchee Marl
	Illinoisan	No record
	Yarmouthian	
	Kansan	
	Aftonian	
	Nebraskan	
Pliocene	Early	No record
	Late	
Miocene	Pontian ?	Tamiami Formation

STRATIGRAPHY ALONG SHELL CREEK

GENERAL STATEMENT

Neogene sediments represented by the Tamiami Formation, Caloosahatchee Marl, and Fort Thompson Formation crop out along the banks of Shell Creek. Most of the exposures are fresh, clean, and fairly accessible; however, in places unconsolidated sands of the Fort Thompson Formation have slumped over at least the upper units of the Caloosahatchee Marl.

Individual exposures rarely exceed 15 feet in thickness, and the average is somewhat less. The maximum composite thickness of all exposed stratigraphic units is approximately 59 feet.

All of the beds are essentially horizontal except where irregularities in the respective depositional interfaces caused primary dips up to 2.0 degrees or more.

All localities examined lie below the 25-foot contour except station SC-14 where the surface is about 42 feet above sea level. A generalized columnar section for Shell Creek (fig. 3) and a map showing the location of measured sections (fig. 4) follow. Correlation of all measured sections is given on plate I in the pocket at the back of this report.

TAMIAMI FORMATION

Distribution: Strata assigned to the Tamiami Formation occur along Shell Creek between stations SC-13, near the east edge of the Cleveland quadrangle, and SC-11 near the west edge of the Bermont quadrangle. The stream distance between these two stations is approximately 1.6 miles. The Tamiami deposits in this area represent the top of an erosional high onto and over which Pleistocene sediments were deposited.

Lithology and fossils: Typically the formation is represented by argillaceous marls and calcareous clays. All the beds are slightly to moderately consolidated, phosphatic, cream to yellowish in color, and sparsely fossiliferous. The facies represented is similar to that of the Alva-Olga area along the Caloosahatchee River (DuBar, 1958c, p. 47-48). Fossils are mainly oysters of the species *Ostrea disparilis* and *Ostrea tamiamiensis*.

Thickness: The total thickness of the formation is unknown as the base has not been observed in Charlotte County. The greatest exposed thickness along Shell Creek is 6.0 feet at station SC-11. In other parts of southern Florida the thickness has been determined to range from 40 to more than 100 feet (DuBar, 1958c, p. 31).

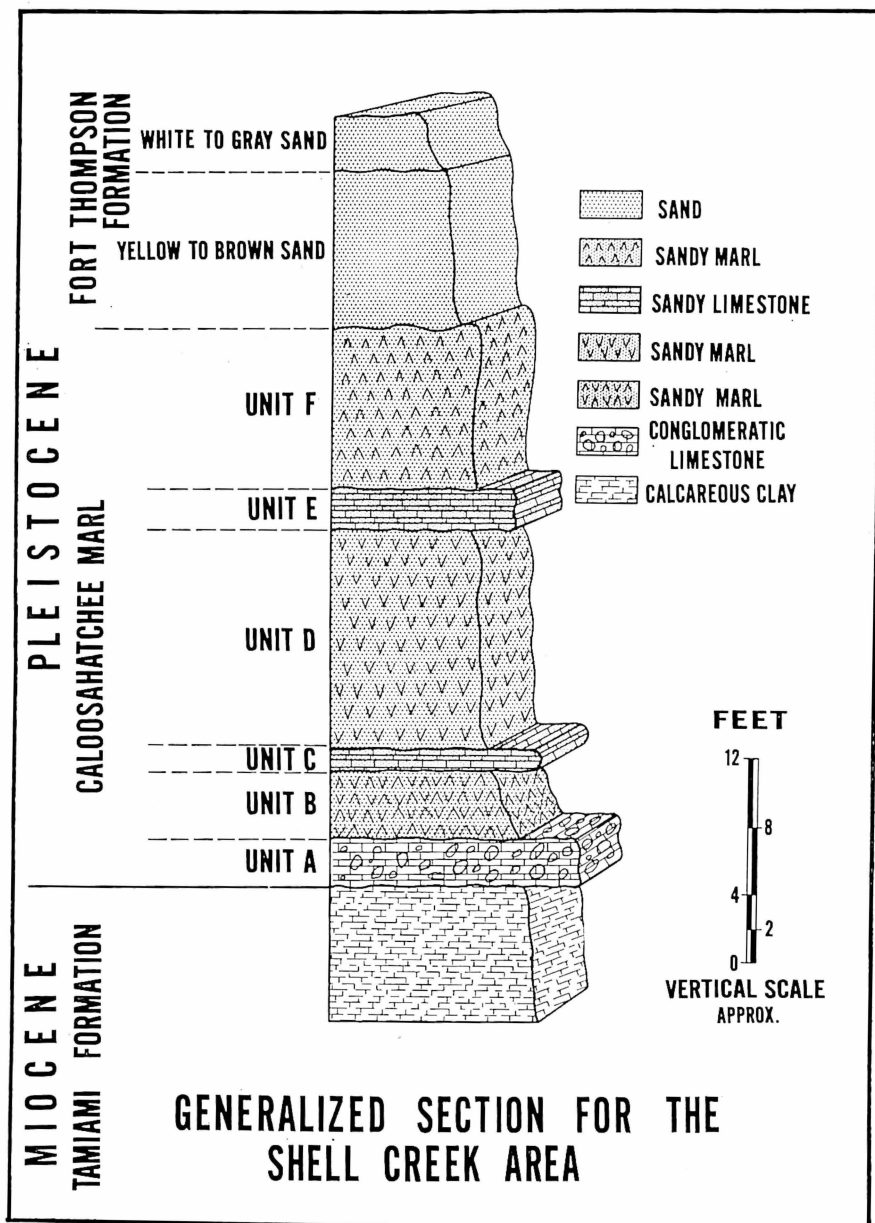


Figure 3. Generalized columnar section for the Shell Creek area.

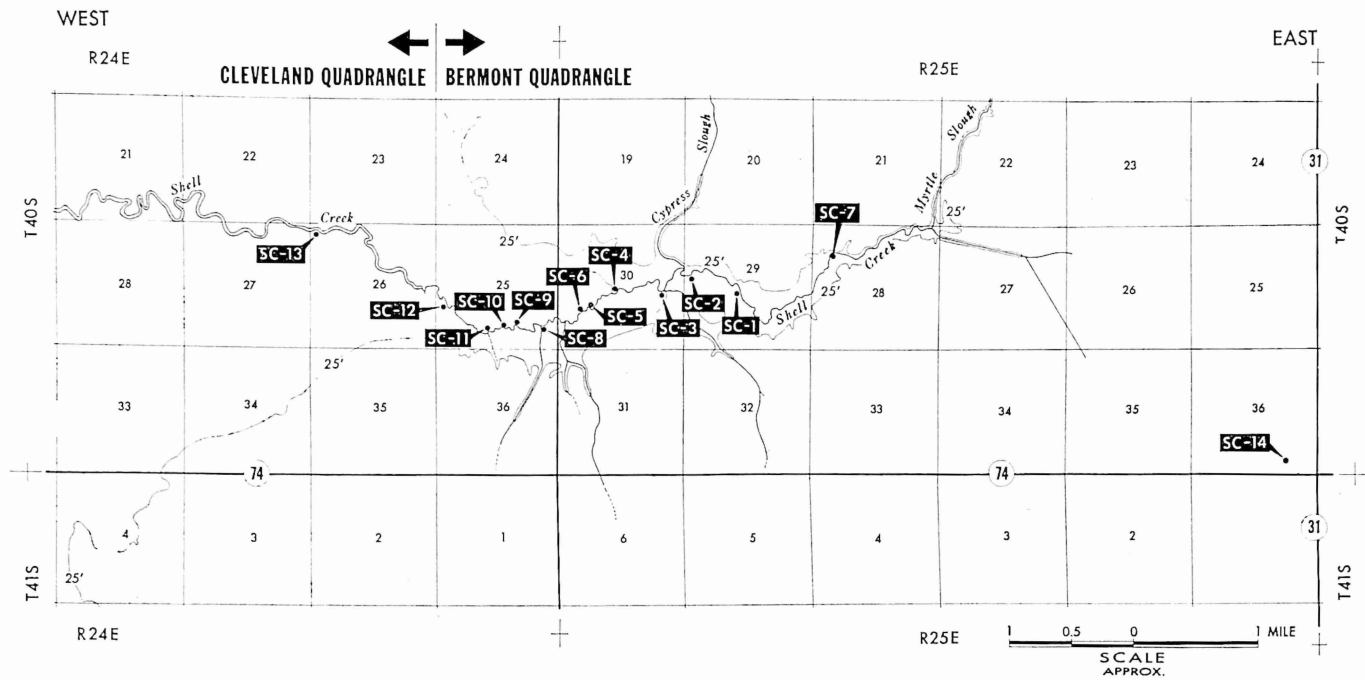


Figure 4. Location of measured sections and localities.

CALOOSAHATCHEE MARL

General statement: The Caloosahatchee Marl of the Shell Creek area probably includes deposits equivalent in age to each of the members recognized by the writer in the type area; however, the members cannot be differentiated in Charlotte County. A generalized columnar section for the Shell Creek area is given in figure 3.

Distribution: Exposures of the Caloosahatchee Marl along Shell Creek are restricted to the Bermont quadrangle (fig. 4). They are nearly continuous from the west edge of the quadrangle eastward at least to the center of the quadrangle (sec. 28, T. 40 S., R. 25 E.), a stream distance of approximately 4.5 miles. This is the most extensive exposure of the Caloosahatchee Marl outside the type area.

The formation extends eastward in subsurface from the center of the Bermont quadrangle at least as far as Bermont, where Caloosahatchee fossils have been thrown up on the spoil piles of shell pits (Mansfield, 1939, p. 24). Near the west edge of the Bermont quadrangle the Caloosahatchee deposits lap up onto a buried rise in the Tamiami Formation. Near the crest of the rise in section 25 on Shell Creek the Caloosahatchee pinches out due, at least in part, to erosion. West of the crest in the Cleveland quadrangle, the Tamiami is overlain unconformably by the sands of the Fort Thompson Formation, the Caloosahatchee deposits being entirely removed by erosion.

Lithology: Typically the Caloosahatchee sediments are composed of unconsolidated, sandy marl, marls, and hard sandy limestones, which are gray, tan or cream in color. Nearly all beds on Shell Creek appear to be less calcareous and contain a higher percentage of sand than those on the Caloosahatchee River.

Contacts: Whenever the base of the Caloosahatchee Marl has been observed along Shell Creek the formation can be seen to lie unconformably on the Tamiami Formation. Everywhere along the creek the marl is unconformably overlain by unfossiliferous sands of the Fort Thompson Formation.

Thickness: At no place along Shell Creek is the entire section of the Caloosahatchee exposed. The maximum exposed thickness of any section is no more than 15 feet, whereas a composite of creek sections indicates the formation is actually as much as 30.5 feet in thickness. The maximum thickness of the type Caloosahatchee Marl is more than 65 feet (DuBar, 1958c, p. 85), but the average is considerably less.

Structure: The amount and direction of regional dip for the Caloosahatchee Marl cannot be accurately determined from the exposures on Shell Creek. The dip is undoubtedly very slight (less than 1°)

and probably in a southwestern direction. All undulations in the Caloosahatchee beds appear primary, being controlled by irregularities of the ancient sea floor.

Stratal units: Dall and Harris (1892, p. 147) recorded the following generalized section for Shell Creek:

Sand	12 feet	Pleistocene (Fort Thompson Formation)
Bed with shallow water fauna including some Pliocene forms	2 feet	Pliocene
Limestone	2-3 feet	(Caloosahatchee Marl)
Marl, similar to that of Caloosahatchee River	?	

Studies by the writer serve to differentiate at least six distinct lithologic units in the Caloosahatchee Marl on Shell Creek (fig. 3). Dall mistakenly assumed that only one thin limestone occurs in the formation, whereas actually there are three fairly similar but different limestone units in the exposed area. The upper two limestone beds divide the unconsolidated fossiliferous marls into three distinct units. The lower limestone is conglomeratic and rests unconformably on the Tamiami marl.

The uppermost marl bed of the Caloosahatchee contains a molluscan fauna which differs from those of the lower units by the absence from it of many of the most characteristic Caloosahatchee species.

The main stratal units of the Caloosahatchee are identified throughout this paper by letters assigned to them in the discussion below.

Lower limestone (Unit A): The lower limestone is the basal unit of the Caloosahatchee Marl on Shell Creek. It lies unconformably on the Tamiami Formation where observed in the vicinity of station SC-11 (sec. 25, T. 40 S., R. 24 E.) at the west edge of the Bermont quadrangle. The maximum thickness of the bed is approximately 3.0 feet.

The basal limestone is conglomeratic (fig. 1), being comprised of a gray sandy limestone matrix enclosing subrounded pebbles, cobbles and small boulders of gray or brown limestone. Unidentifiable shell fragments occur in the matrix and in the cobbles and boulders.

The insoluble residue of a sample of the limestone matrix is 9.0 percent by weight and is composed of approximately 25 percent sub-angular quartz sand and 75 percent silt and clay.

Lower marl (Unit B): The basal conglomeratic limestone (Unit A) is conformably overlain by a bed of unconsolidated, fossiliferous marine

marl (Unit B) having a maximum observed thickness of 4 feet. The lowest marl unit is known only from station SC-10 (sec. 25, T. 40 S., R. 24 E.) in the extreme western part of the Bermont quadrangle. The marl is light olive gray on a fresh surface, sandy, calcareous, and slightly phosphatic. Fossils are abundant and well preserved, being comprised mainly of pelecypod and gastropod species, but include a sparse foraminiferal fauna.

Middle limestone (Unit C): The limestone of this unit, known only from station SC-10 (sec. 25, T. 40 S., R. 24 E.) where it has a thickness of 3.0 feet, closely resembles that of the upper limestone (Unit E) and apparently has been mistaken for it by earlier workers. Unit C is of marine origin, white, sandy, argillaceous, and contains an abundant fauna of Caloosahatchee mollusks. The insoluble residue of a sample from station SC-10 is 16.5 percent by weight and consists mostly of fine to medium subangular quartz sand, and about 5.0 percent clay.

Middle marl (Unit D): The middle shell marl (fig. 5) can be traced from station SC-10 near the west edge of the Bermont quadrangle eastward along Shell Creek to station SC-1 (sec. 29, T. 40 S., R. 25 E.) where it has been thrown up onto the spoil piles along the pits of the

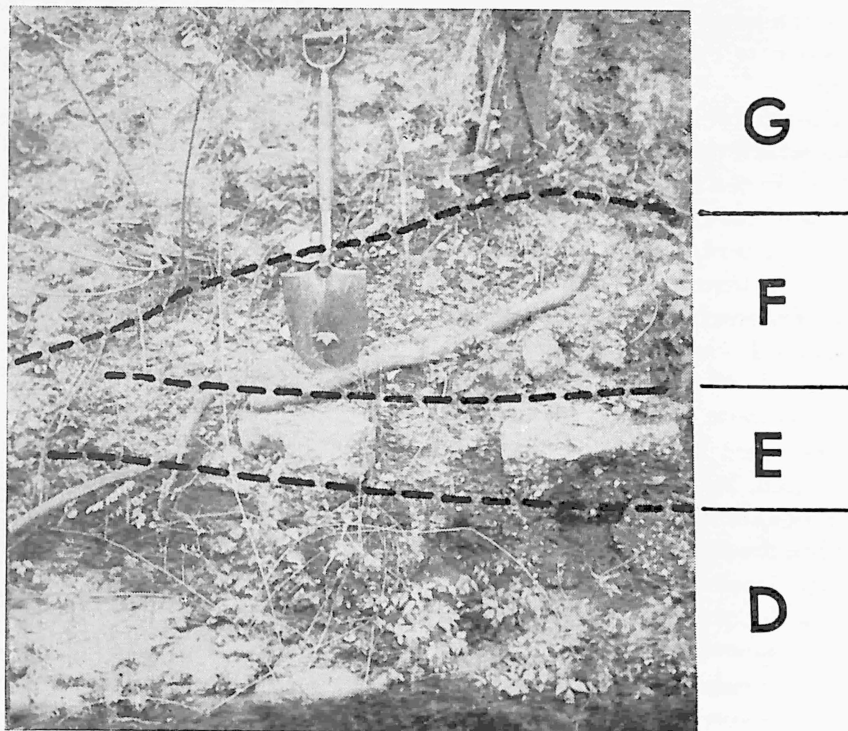


Figure 5. Section SC-8 on Shell Creek.

Karnes Shell Corporation. This is a stream distance of more than 3.0 miles, and about 2.0 miles in an east-west traverse.

Exposures of the marl average about 3 to 4 feet in thickness reaching a maximum of 11 feet at station SC-9 (sec. 25, T. 40 S., R. 24 E.). At station SC-1 the marl occurs only in subsurface in the bottom of the pits of the Karnes Shell Corporation.

Most typically the unit is a soft unconsolidated calcareous gray marl, but at stations SC-9 and SC-8 the upper 1.0 to 5.0 feet is very sandy and yellowish brown in color.

Caloosahatchee mollusks are abundant and well preserved throughout the entire unit and at all exposures, but foraminiferal species, ostracodes, and echinoid spines are most abundant in the lowermost calcareous part of the unit.

Upper limestone (Unit E): Overlying the middle marl (Unit D) is the upper limestone (fig. 6) which is the most useful marker bed exposed along Shell Creek. The bed varies in thickness from 1.0 to 2.5 feet, but can be easily traced from station SC-9 in the western part of the Bermont quadrangle eastward at least to a point approximately 0.5 mile east of station SC-7 (sec. 28, T. 40 S., R. 25 E.). Thus, the unit



Figure 6. Ledge of upper Caloosahatchee limestone (Unit E) exposed along Shell Creek at station SC-5.

is exposed for a stream distance of more than 4.5 miles and a distance of nearly 3.0 miles in an east-west traverse.

Lithologically the limestone is sandy, hard, and gray, and contains an abundance of well preserved Caloosahatchee marine mollusks. It resembles the limestone of Unit C, but differs in being much more sandy. Insoluble residues from four samples of the limestone range from 36.5 to 49.0 percent by weight with 2 to 10 percent being clay and the remainder fine to medium, subrounded quartz sand. In general, the insoluble residue and the clay content of the residue increases eastward.

Upper marl (Unit F): The upper marl is best developed along Shell Creek between stations SC-9 and SC-1, but it can be traced eastward on Shell Creek to a point approximately 0.5 mile east of station SC-7 (SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, T. 40 S., R. 25 E.) and occurs on spoil piles of shell pits at Bermont. This represents a total east-west distance of about 6.5 miles and a distance along the stream of approximately 4.5 miles.

The unit typically is an unconsolidated sandy, gray, marine shell marl. The sand is primarily comprised of subrounded, clear, medium-sized grains of quartz, but includes a small number of rounded, shiny black phosphorite grains.

The upper marl deserves special mention because its molluscan fauna differs considerably from that of the lower Caloosahatchee strata. As indicated, the difference is due mainly to the disappearance of many of the tropical species found in the lower beds rather than the introduction of new species. Many of the species of Unit F are unknown in the succeeding Fort Thompson and Recent faunas. These facts suggest a cooling of the water possibly related to the initiation of a glacial stage.

Inasmuch as the upper marl lies conformably on the upper limestone (Unit E) and is in turn unconformably overlain by unfossiliferous Fort Thompson sands there is little doubt that it is the uppermost Caloosahatchee unit on Shell Creek. The stratigraphic position of Unit F and its molluscan fauna suggest that it is equivalent to the upper Caloosahatchee *Panope* Faunizone at Ortona Locks in the type area (DuBar, 1958c, p. 75). Some characteristic molluscan species which occur in both faunas are listed below.

Pelecypoda

Anadara lienosa (Say)
Anomalocardia caloosana Dall
Chama gardnerae Olsson and Harbison
Chione latilirata athleta (Conrad)
Chlamys fuscopurpureus (Conrad)
Dosinia elegans Conrad

Echinochama cornuta (Conrad)
Eucrassatella speciosa (A. Adams)
Juliacorbula scutata (Gardner)
Noetia platyura Dall
Ostrea sculpturata Conrad
Plicatula marginata Say

Gastropoda

Atabina adamsi (Dall)
Conus stearnsi Conrad
Fasciolaria apicina Dall

Natica plicatella Conrad
Oliva sayana Ravenel
Strombus alatus Gmelin

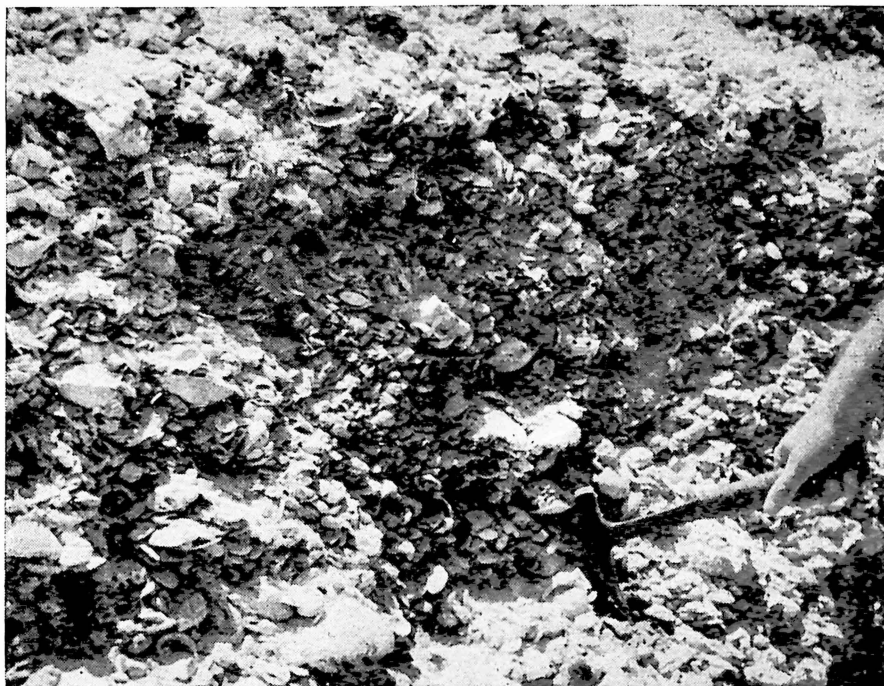


Figure 7. The upper shell marl (Unit F) at station SC-1.

FORT THOMPSON FORMATION

Along Shell Creek the Fort Thompson Formation is comprised of seemingly unfossiliferous sands. It is postulated that these sands were deposited close to the shoreline but mainly above sea level. They are in part equivalent to shell marls of the Fort Thompson found elsewhere in Charlotte County at lower elevations.

Because the sands are unconsolidated, exposures are commonly slumped and grown over with vegetation. However, at numerous places along Shell Creek the sand is freshly exposed. The freshest and most complete exposures of the sands can be seen in the shell pits of the Karnes Shell Corporation (fig. 8) where they reach a thickness of 11.0 feet. Elsewhere along Shell Creek generally not more than 3 feet of the sands are exposed.

All the sands are comprised predominantly of fine to medium, sub-angular to subrounded fairly well sorted quartz grains. The color of the beds is yellow, pale orange to tan or gray. The upper 1 to 3 feet are comprised of a light gray to white quartz sand which possibly has been reworked during post-Wisconsinan (Recent) time as it appears to rest unconformably on the lower sands.

The Fort Thompson sands extend along the entire length of Shell Creek, lying upstream from station SC-10 unconformably on the Caloosahatchee Marl, and downstream from station SC-10 unconformably on the Tamiami Formation.

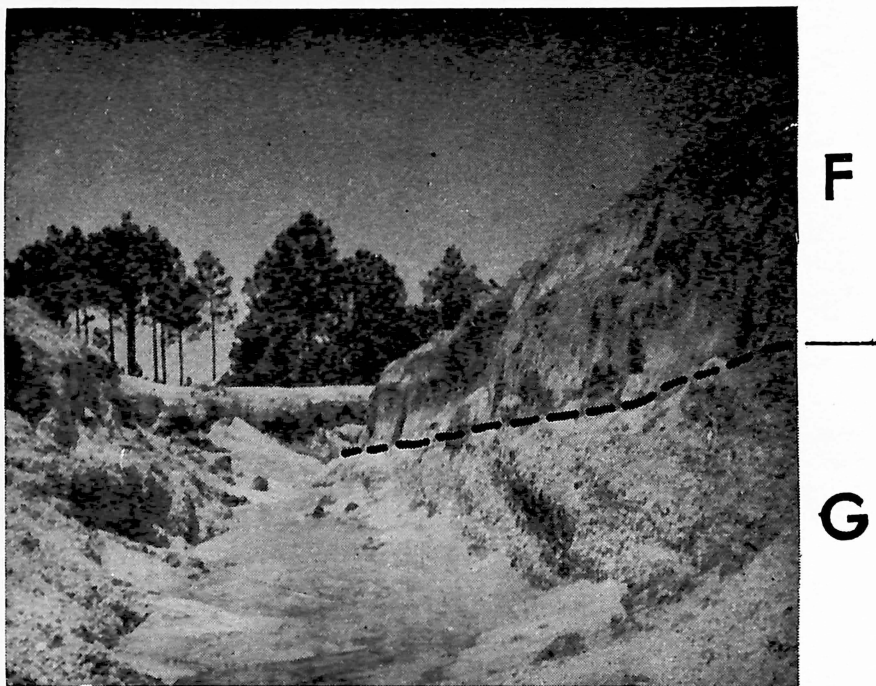


Figure 8. Station SC-1 in the Karnes Shell Pit near Shell Creek.

STRATIGRAPHY ALONG ALLIGATOR CREEK

GENERAL STATEMENT

Neogene sediments are exposed discontinuously along the banks of Alligator Creek from station D-7 (sec. 29, T. 41 S., R. 23 E.) approximately 0.5 miles west of Acline in Punta Gorda quadrangle eastward to station D-8 (sec. 26, T. 41 S., R. 23 E.) at Bridge 18 on the South Prong in Cleveland quadrangle. This is a stream distance of more than 4.0 miles and a distance in an east-west traverse of approximately 2.8 miles. The most continuous exposures occur between U. S. Highway 41 and the dam across Alligator Creek east of Acline (sec. 21, T. 41. S., R. 23 E.) in the Punta Gorda quadrangle (fig. 4).

The discontinuous nature of the exposures makes lateral tracing of individual units difficult and thus detailed studies such as those made of the deposits along Shell Creek and the Caloosahatchee River are virtually impossible.

All the beds are essentially horizontal; however, there are slight undulations apparently caused by irregularities on the original sea floor.

The maximum thickness of the exposures nowhere exceeds 15 feet and is generally less. The composite thickness is unknown but is apparently considerably greater than 15 feet.

All of the exposures lie below the 15-foot contour except the deposits at station D-8 where the surface is about 20 feet above sea level.

A correlation of sections is shown on plate II in the pocket at the back of this report.

TAMIAMI FORMATION

Distribution: The Tamiami Formation is exposed along Alligator Creek from a point 0.5 mile east of U. S. Highway 41 eastward to the dam, a stream distance of about 1 mile. It is also known from a ditch at Bridge 18 on the South Prong of Alligator Creek.

Lithology and fossils: The Tamiami Formation is comprised of clays, marls, sands, and a few thin limestones. Most of the units, except the limestones, are only slightly consolidated, and nearly all are at least slightly phosphatic. Colors range from gray through tan, cream, and buff. Sands, in general, are most common to the east (*i.e.*, stations D-7 and D-8) with calcareous clays, limestones, and marls predominant toward the west. Fossils are mainly oysters of the species *Ostrea disparilis* and *Ostrea tamiamiensis*; however, the sands yield great numbers of the echinoid *Encope tamiamiensis* and clusters of the giant barnacle *Balanus concavus*, most of which are well preserved.

Thickness: The total thickness of the formation is unknown. The greatest exposed thickness occurs at station D-5 where approximately 5 feet of the formation rises above low tide level.

CALOOSAHATCHEE MARL

Distribution: The area of exposure for the Caloosahatchee Marl is essentially the same as that for the Tamiami Formation, the principal difference being that the Caloosahatchee Marl extends slightly farther to the west.

Lithology: At all exposures the Caloosahatchee Marl is represented by a tan, sandy, unconsolidated marl, being comprised in large part by well preserved molluscan shells.

Thickness: All along Alligator Creek the Caloosahatchee Marl is thin, reaching a maximum thickness of approximately 3.0 feet at stations D-6 and D-8, but being represented only by traces in solution pockets at stations D-5 and D-2.

Contacts: As elsewhere in southern Florida where the base of the formation has been observed, the Caloosahatchee Marl lies unconformably on the Tamiami Formation. The marl is, in turn, unconformably overlain by sands of the Fort Thompson Formation.

FORT THOMPSON FORMATION

Distribution: The Fort Thompson Formation forms a blanket over all the surface that lies below the Pamlico shoreline. It is well exposed all along Alligator Creek forming the uppermost unit at all stations examined.

Lithology and fossils: As on Shell Creek, all the deposits that unconformably overlie the Caloosahatchee Marl are placed in the Fort Thompson Formation. Along Alligator Creek the formation is most commonly represented by seemingly unfossiliferous, tan to brown, unconsolidated quartz sands. The quartz grains are subrounded, fairly well sorted and predominantly medium in grain size. At station D-7 (sec. 29, T. 41 S., R. 23 E., Punta Gorda quadrangle) the Fort Thompson includes a 1-foot bed of unfossiliferous limestone and a sandy, calcareous marl with abundant mollusk shells. At station D-20 (NE¼NW¼ sec. 21, T. 41 S., R. 23 E., Punta Gorda quadrangle) the formation is exposed in a shell pit where it includes, in addition to unfossiliferous sands, two sandy shell beds totaling 8.8 feet in thickness. The fauna is comprised largely of well preserved mollusks similar to those of the type Coffee Mill Hammock Marl member of the Fort Thompson Formation.

Thickness: Along Alligator Creek the maximum thickness of the formation occurs at station D-4 where it measures 8.4 feet. At station D-20, 15.2 feet of the formation are exposed. The average exposed thickness along Alligator Creek is about 5.0 feet.

STRATIGRAPHY SOUTH OF ALLIGATOR CREEK

Only a few exposures occur along the eastern shore of Charlotte Harbor in the area immediately south of Alligator Creek. Exposures are restricted to marl and sand pits, marinas, drainage ditches, and the banks of small streams. Nowhere are more than a few feet of sediments exposed and at most localities only spoil pile materials are available for examination.

Not much can be said about the stratigraphy of the area without subsurface data and better exposures; however, a few observations are worthy of note. Nowhere in the area does the Tamiami Formation appear to be more than 5 to 10 feet beneath the surface. At most places the Tamiami is very argillaceous, containing numerous well preserved oysters; however, near Acline the formation is represented, in part, by sands bearing a fauna of *Encope tamiamiensis* and *Balanus concavus*. Deep marl pits near Acline have penetrated shell beds that have yielded

a large molluscan fauna discussed elsewhere in this paper. At a few places the Caloosahatchee Marl was observed to overlie the Tamiami Formation. At station D-24 (NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, T. 42 S., R. 23 E.) the Caloosahatchee is represented by a thin marine limestone containing numerous vertebrate remains, including teeth of the Pleistocene horse *Equus* (*Equus*) cf. *E. leidy*.

Apparently the entire area is covered by a thin bed of unconsolidated quartz sand and assignable to the Fort Thompson Formation. At several localities sandy shell marls carrying a late Pleistocene molluscan fauna were observed beneath the unfossiliferous sands. These beds are perhaps equivalent to the Coffee Mill Hammock Marl member of the Fort Thompson Formation.

All the exposures of the area studied by the writer lie below an elevation of 20 feet above sea level and all are located in the Punta Gorda SE quadrangle.

STRATIGRAPHY AT WARM MINERAL SPRINGS

At Warm Mineral Springs unconsolidated sands, and marine and non-marine shell beds are exposed along drainage canals and other excavations. Collections made by Herbert Winters in 1957 were studied by the writer.

Warm Mineral Springs is located at Salt Creek about 1.5 miles east of U.S. Highway 41 bridge across Myakka River in Sarasota County. All of the area lies below the 20-foot contour.

A generalized stratigraphic section for the area is presented below:

	Feet
Sand, quartz, unconsolidated, reddish brown and gray; no fossils observed.....	3.0-5.0
Shell marl, marine, sandy, fine to medium grained, unconsolidated, tan; many mollusk shells and some vertebrate fossils including teeth of the Pleistocene horse <i>Equus</i> (<i>Equus</i>) <i>leidy</i>	0.0-0.5
Oyster marl, occurs locally as lenses.....	0.0-0.5
Marl, fresh water unconsolidated, gray; contains mollusks and vertebrate remains.....	>0.5

The vertebrate and molluscan fauna plus the evidence of the paleogeographic setting and stratigraphic position prove the deposit to be late Pleistocene in age. Lithologically and faunally the deposits are very similar to the Fort Thompson Formation in southern Florida and Pinellas County and are assigned to that formation.

PALEOECOLOGY

GENERAL DISCUSSION

Paleoecological interpretations included in the following pages are based almost exclusively on the macrofauna, especially the very abundant mollusks, and on the sediments in which the fauna occurs. Detailed discussion of conclusions based on the microfauna will await completion of studies being conducted by Harbans S. Puri and V. V. Vanstrum. The Caloosahatchee Foraminifera from two Shell Creek stations were identified by Gene Ross Kellough. With the exception of "*Rotalia*" *beccarii*, none of the species reported by Cole (1931) were observed (appendix).

Collections for this study were made from 29 stations in the Charlotte Harbor area. Where the physical properties of the stratal units permitted, the samples were washed, and the macrofauna separated and sorted. Subsequently, relative abundance of each species in each sample was determined. In calculating percentages two pelecypod valves were always counted as one individual.

Many of the molluscan species still live in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea, and a high percentage of the extinct forms differ only slightly from living species of these areas. Thus it is possible to make comparative studies between the fossil and living assemblages and to base ecological conclusions heavily on the subsequent deductions. It is assumed, applying the principle of uniformitarianism, that most of the fossils lived in environments similar to those of their living descendants.

Not as much is known about the ecology of living mollusks as is desirable, but the recent work of Parker (1956, 1959) and Clench (1942-1956) has added important information about the mollusks of the Gulf of Mexico and the western Atlantic. Other important reference works were discussed by DuBar (1958c, p. 86) in his study of the Caloosahatchee River area.

TAMIAMI FORMATION

Most of the deposits assigned to the Tamiami Formation are relatively unfossiliferous, making paleoecological interpretation difficult. Typically, the Tamiami is comprised of fine grained clastics such as clay, and argillaceous limestones in which specimens of *Ostrea sculpturata*, *Ostrea disparilis* and *Ostrea tamiamiensis*, and molds of other mollusks are locally common. Such deposits probably were formed in the brackish water of a lagoon or bay.

At places on Alligator Creek and in pits near Acline, the formation is represented by a phosphatic quartz sand containing many specimens

of the sand dollar *Encope macrophora tamiamiensis* and the giant barnacle *Balanus concavus*. It is postulated that these sands represent deposition in a shallow water, nearshore environment, possibly a submerged sandbar. Both the sands and the finer grained facies probably represent deposition in a regressing Tamiami Sea.

CALOOSAHATCHEE MARL

GENERAL DISCUSSION

Fossils of the Caloosahatchee Marl in the vicinity of Charlotte Harbor are generally as well preserved as those of the type area. Breakage seems mostly related to compaction, and little evidence of abrasion due to wave or current action is apparent. Delicate structures such as spines, nodes, and protoconchs are usually preserved; pelecypods are commonly represented by paired valves and many appear to occupy their original burrows in the substrata. Mixing of ecologic types is not great, being much less common than in the Caloosahatchee River area.

Most of the exposures studied contain highly fossiliferous units from which the fossils are easily extracted. Pelecypods and gastropods are by far the most abundant fossils in the Caloosahatchee Marl, but scaphopods, amphineurids, brachiopods, decapods, echinoids, barnacles, corals, bryozoans, foraminifers, and ostracodes are also represented. Twenty 0.5 cubic-foot samples of the shell marls on Shell and Alligator creeks yielded 79,755 pelecypods and 33,615 gastropods, representing 126 species and subspecies of pelecypods, 243 species and subspecies of gastropods, and 5 species of scaphopods. A total of 793 species and subspecies of mollusks have been recorded by the writer and other workers from the Caloosahatchee Marl of the Charlotte Harbor area.

Most of the extant molluscan species live south of Cape Hatteras, but a few range northward from there. None of the species are restricted to northern waters, and many occur no farther north than Florida. Most of the extinct species are very similar to Recent species from waters south of northern Florida. In general, the typical Caloosahatchee fauna appears to have lived in a tropical sea. Based on studies of the Foraminifera, Cole (1931) stated that the minimum temperature of the Caloosahatchee Sea was 22° C. (71° F.). Most of the Charlotte Harbor area faunas indicate an inner shelf environment; some are characteristic of outer, deeper parts of the inner shelf, whereas others are most characteristic of shallow, near-shore environments where the water was only a few fathoms in depth. Brackish water faunas similar to those of the Fort Denaud Marl member of the type Caloosahatchee Marl are unknown except from the base of the lower marl (Unit B) at station SC-10 on Shell Creek. Fresh water and land mollusks, echinoids, and corals are

also much less abundant in the Charlotte Harbor area than in certain beds along the Caloosahatchee River.

Most of the fauna occurs in unconsolidated sands or shell marls, but there are a few thin layers of fossiliferous sandy limestone. In general, the Caloosahatchee Marl, which is exposed near Charlotte Harbor, is less calcareous and more sandy than in the type area.

As in the type area, the Caloosahatchee Sea transgressed the Charlotte Harbor area over a dissected Tamiami terrain. Shoals formed over the tops of Tamiami highs, and during low stands of the sea, these highs might have stood above sea level as low islands. Southward from Alligator Creek the Tamiami Formation stands relatively high throughout a large area, possibly having acted as a partial barrier between the Caloosahatchee Sea to the north and that of the type area to the southeast. Thin Caloosahatchee marls are found along the margins of this high area but do not now extend over the top. Inasmuch as these marginal deposits both to the north and southeast contain offshore faunas, it appears probable that the entire high area was once covered by thin Caloosahatchee deposits which, prior to deposition of the Fort Thompson Formation, were eroded away.

During low stands of the sea the main shoreline was probably only a few miles westward, but during the highest stand of the sea, probably represented by the upper part of the lower marl (Unit B) and the lower middle marl (Unit D) on Shell Creek, the shoreline lay relatively far to the west, quite possibly being the Wicomico (90-100 feet above sea level), which is located approximately 25 miles northwest of the exposures on Shell Creek. If this supposition is correct, then the maximum depth of the Caloosahatchee Sea in the Charlotte Harbor area was no more than approximately 16 fathoms, a figure which agrees well with that suggested by the molluscan faunas. Cole (1931) also estimated that the maximum depth of the Caloosahatchee Sea was 16 fathoms.

SHELL CREEK

Lower limestone (Unit A): Little can be said about the depositional environment of Unit A, as it is known only from one locality and the samples collected contain only fragmented unidentifiable marine mollusks.

Apparently Unit A is comprised of reworked Tamiami limestone nodules and a fossil hash cemented by calcareous, sandy, argillaceous mud. It can be concluded from the degree of rounding that the limestone nodules were transported at least a short distance. The broken shells also suggest considerable reworking by waves or strong currents. It seems likely that Unit A formed in shallow near-shore waters of considerable turbulence.

Lower marl (Unit B): Two depositional environments are represented by the molluscan fauna collected from Unit B. The lowermost part of the bed which occurs below water level at station SC-10 includes a relatively large number of *Rangia nasuta* and *Crassostrea virginica* valves, suggesting for that part of the unit an extremely brackish water environment. Above the lower few inches of Unit B the molluscan fauna is comprised of extant species and extinct species most characteristic of offshore, shallow water of the inner continental shelf as defined by Parker (1956, p. 337). In this upper part of the bed typical fresh water, brackish water, land, and strandline species are absent or extremely rare.

The molluscan species of the lower marl (Unit B) are listed below:

Pelecypoda	Percent	Pelecypoda	Percent
<i>Anadara rustica</i> (Tuomey and Holmes)P		? <i>Mulinia</i> sp. (worn fragments).....P	
<i>Anomia simplex</i> d'Orbigny .....P		<i>Nuculana acuta</i> (Conrad).....4.5	
<i>Barbatia taeniata</i> (Dall).....P		<i>Nucula proxima</i> Say.....P	
<i>Caryocorbula leonensis</i> Mansfield.....9.1		<i>Ostrea sculpturata</i> Conrad.....P	
<i>Chione cancellata</i> (Linné).....33.0		<i>Phacoides vaccamawensis</i> Dall.....6.8	
<i>Crassinella acuta</i> (Dall).....2.2		<i>Rangia nasuta</i> (Dall).....P	
<i>Crassostrea virginica</i> (Gmelin).....P		<i>Tellina</i> sp.....P	
<i>Dosinia elegans</i> Conrad.....P		<i>Trigoniocardia willcoxi</i> (Dall).....12.1	
<i>Fossularca adamsi</i> (Dall).....P		<i>Varicorbula caloosae</i> (Dall).....22.6	
<i>Gouldia</i> cf. <i>G. metatriatum</i> Conrad...1.5			
Gastropoda	Percent	Gastropoda	Percent
<i>Alabina adamsi</i> (Dall).....2.3		<i>Natica canrena</i> Linné.....P	
<i>Alabina cerithioides</i> (Dall).....18.2		<i>Persicula ovula</i> Conrad.....2.6	
<i>Brachythara terminula</i> (Dall).....P		<i>Polystira albida</i> (Perry).....P	
<i>Cobularia lanceolata acinica</i>		<i>Rissoina bulimina</i>	
Tucker and Wilson.....P		Olsson and Harbison.....2.3	
<i>Crepidula aculeata</i> Gmelin.....2.3		<i>Strombus alatus</i> Gmelin.....P	
<i>Crepidula maculosa</i> Conrad.....2.3		<i>Tectonatica pusilla</i> (Say).....13.7	
<i>Crucibulum auriculum</i> Gmelin.....34.3		<i>Trophon lepidota</i> (Dall).....P	
<i>Fasciolaria scalarina</i> Heilprin.....P		<i>Turritella apicalis</i> Heilprin.....2.6	
<i>Marginella eulima</i> Dall.....3.1		<i>Turritella perattenuata</i> Heilprin....3.4	
<i>Marginella pardalis</i> Dall.....2.6		<i>Turritella subannulata</i> Heilprin....1.1	
<i>Melongena</i> sp.....4.5		<i>Vermicularia</i> sp.....P	
<i>Nassarius bidentatus</i> (Emmons).....P			

P = Present but less than 1.0 percent

Chione cancellata, the most abundant species in the fauna of upper Unit B, lives today in high salinity waters of bays, inlets, and the shallow shelf, being most characteristic, according to Parker (1956, p. 331), of inlets. Studies of fossil faunas in Florida suggest that during Caloosahatchee time *Chione cancellata* reached its maximum development, and was then apparently most abundant on the inner continental shelf where it comprised a high percentage of the infauna. *Varicorbula caloosae*, second in abundance in Unit B, is closely related to the Recent species *Varicorbula operculata* (Philippi), which lives from the deeper parts of the inner shelf to depths on the outer shelf of at least 250 fathoms

(Abbott, 1953). *Varicorbula caloosae* is also common in the outer shelf Bee Branch member of the Caloosahatchee Marl in the type area (DuBar, 1958).

The most abundant gastropod in the fauna is *Crucibulum auriculum* found living at least to 54 fathoms on the continental shelf. Other common gastropods such as *Alabina cerithioides* and *Tectonactica pusilla* live on the inner shelf to moderate depths. The relative abundance of the genus *Turritella*, a neritic, quiet water genus, also suggests an offshore origin for Unit B.

All the fossils are well preserved, being little worn or disturbed by wave action, which also suggests a relatively deep water, offshore environment.

Few of the molluscan species with living representatives range north of Cape Hatteras, and some are not known north of Florida. Most of the extinct species are closely related to species which live in Florida, Gulf of Mexico, and Caribbean waters. Thus, it appears that the water in which the Unit B fauna lived was at least as warm and probably warmer than that off southwestern Florida today.

The bottom in and on which the fauna lived was an unconsolidated mixture of shells and fine to medium quartz sand similar to that found off the southwestern coast of Florida at depths between 5 and 20 fathoms (Gould and Stewart, 1955, p. 5).

Middle limestone (Unit C): The limestone comprising Unit C contains a molluscan fauna that suggests deposition in a warm shallow water environment similar to that for the upper part of Unit B. The fauna identified from station SC-10, the only locality where Unit C is known to crop out, is listed below:

Pelecypoda

Anomalocardia caloosana Dall
Arca wagneriana Dall
Chama gardnerae Olsson and Harbison
Chione cancellata (Linné)—relatively abundant
Mulina sp.
Trachycardium sp.
Varicorbula caloosae (Dall)—relatively abundant

Gastropoda

Crepidula aculeata Gmelin
Crucibulum auriculum Gmelin
?Petalonchus sp.
Turritella apicalis Heilprin—relatively abundant

Apparently deposition of Unit C ceased when the supply of quartz sands to the area was greatly reduced. This event would not, of necessity, be related to change in water depth or even proximity to shore. It is possible that a shift in offshore currents or a change in the source area could have changed the rate of sand deposition.

Middle marl (Unit D): The molluscan fauna of Unit D is large and varied and, in general, indicates a warm water, offshore, inner shelf

environment similar to that postulated for the upper part of Unit B. The fauna is well preserved throughout the exposed area, and there is little evidence anywhere of significant reworking by waves or currents. The latter observation suggests deposition in relatively deep, quiet water.

Distribution of the most abundant molluscan species is shown in table 2:

TABLE 2. Most Abundant Molluscan Species in Unit D of the Caloosahatchee Marl on Shell Creek
(P = Present, but less than 1.0 percent)

Species	Stations					
	10	9	8-1a	8-1b	6	5
Pelecypoda	%	%	%	%	%	%
<i>Anomalocardia caloosana</i>			P	3.8	6.1	P
<i>Anomia simplex</i>	2.5	2.6	2.0	P	P	P
<i>Caryocorbula leonensis</i>	3.1	6.8	1.4			P
<i>Chione cancellata</i>	21.8	18.7	23.2	7.0	9.1	50.0
<i>Crassinella acuta</i> and <i>C. lunulata</i>	1.5	1.6	P	23.0	17.6	2.4
<i>Fossularca adamsi</i>	P	5.2	1.4	P	P	P
<i>Ostrea sculpturata</i>	2.8	P	2.7	P	P	2.4
<i>Parastarte triquetra</i>	4.0	P	7.1	33.3	32.1	18.1
<i>Phacoides multilineatus</i>	6.3	5.0	5.5	9.7	13.9	7.9
<i>Phacoides vaccamawensis</i>	1.0	2.6	1.6	P	P	1.1
<i>Transennella conradina</i>	1.5		P	17.3	17.4	1.7
<i>Trigoniocardia willcoxi</i>	7.0	11.1	7.1			2.1
<i>Varicorbula caloosae</i>	38.6	31.1	39.3	P	P	3.9
Gastropoda						
<i>Alabina adamsi</i>	2.4	P	2.6	34.9	35.7	24.0
<i>Alabina cerithidioides</i>	4.8	9.6	1.5			1.6
<i>Anachis caloosaensis</i>	2.4	P	4.0			P
<i>Anachis gardnerae</i>	3.2	2.4	1.1	1.2		1.2
<i>Caecum</i> spp.	6.4		1.5	4.6	3.5	3.6
<i>Cerithium litharium</i>	P			6.2	5.4	P
<i>Crepidula aculeata</i>	P	1.6	1.5	P		1.2
<i>Crepidula maculosa</i>	P		1.5	2.7	1.4	P
<i>Crucibulum auriculum</i>	38.3	46.7	40.2	4.2	4.2	P
<i>Marginella eulima</i>	1.1	2.6	1.1		3.6	P
<i>Marginella pardalis</i>		3.7	3.8	6.5		P
<i>Meioceras cingulatum</i>			1.5	1.9	9.4	5.6
<i>Olivella mutica</i>	2.4			8.7	4.2	3.2
<i>Retusa canaliculata</i>	P		1.1	12.5	9.4	4.0
<i>Tectonatica pusilla</i>	8.8	4.8				
<i>Teinostoma tectispira</i>	1.6		1.1	1.9	P	2.3
<i>Turritella apicalis</i>	P	3.1				P
<i>Turritella perattenuata</i>	1.7	2.0	1.6	P	P	1.3
<i>Turritella subannulata</i>	P	P	4.2	P	1.8	1.6

Other species in addition to those listed in table 2, that are common in Unit D, particularly larger forms, are listed below:

Pelecypoda

<i>Anadara lienosa</i> (Say)	<i>Dosinia elegans</i> Conrad
<i>Anadara rustica</i> (Tuomey and Holmes)	<i>Echinochama cornuta</i> (Conrad)
<i>Arca wagneriana</i> Dall	<i>Macrocallista nimbosa</i> Solander
<i>Bothrocorbula willcoxi</i> (Dall)	<i>Nucula proxima</i> Say
<i>Chama gardnerae</i> Olsson and Harbison	<i>Nuculana acuta</i> Conrad
<i>Chlamys fuscopurpureus</i> (Conrad)	<i>Plicatula marginata</i> Say

Gastropoda

<i>Anachis caloosaensis</i> (Dall)	<i>Lemintina decussata</i> (Gmelin)
<i>Busycon contrarium</i> (Conrad)	<i>Nassarius</i> cf. <i>N. consensus</i> Ravenel
<i>Conus adversarius</i> Conrad	<i>Pyrgiscus</i> spp.
<i>Conus stearnsi</i> Conrad	<i>Ringicula floridana</i> Dall
<i>Hanetia mengineana</i> (Dall)	

The distribution and relative abundance of the species listed in table 2 indicate a change of environment from east (station SC-5) to west (station SC-10) which, however, is not clearly reflected in the sediments. At station SC-8 the eastern faunal facies vertically overlaps the western facies and at this station the upper (eastern) facies is more sandy than the lower facies (western).

The change in faunal facies from east to west is probably, in part, related to proximity of the shoreline. The western faunas (stations SC-10 and SC-9) and the lower fauna at station SC-8 contain a relatively greater abundance of species judged to indicate offshore or at least relatively deep water conditions. These species include *Varicorbula caloosae*, *Caryocorbula leonensis*, *Crucibulum auriculum*, *Turritella perattenuata*, and *Turritella apicalis*. The eastern faunas (stations SC-5 and SC-6) and the upper layer at station SC-8 contain a relatively greater abundance of shallow water, near-shore species. These species include *Anomalocardia caloosana*, *Crassinella* spp., *Parastarte triquetra*, *Phacoides multilineatus*, *Transennella conradina*, *Alabina adamsi*, *Caecum* spp., *Cerithium litharium*, *Meioceras cingulatum*, *Olivella mutica*, and *Retusa canaliculata*.

The foraminiferal fauna of the lower bed at station SC-8 was studied and the complete list of species is given in the appendix. The most abundant species are listed below:

<i>Elphidium</i> spp.	54 percent
" <i>Rotalia</i> " <i>beccarii</i> vars.	26 percent
<i>Quinqueloculina</i> spp.	9 percent
<i>Cibicides</i> spp.	8 percent

Numerous studies have been made of the Recent foraminifers from the shallow waters of the Gulf of Mexico (Bandy, 1954, 1956; Kornfeld,

1931; Ladd, 1951; Lankford, 1959; Lowman, 1949; Parker, Phleger, and Pierson, 1953; Phleger, 1951, 1954, 1955; Phleger and Parker, 1951) with the result that much is now known about the ecology of extant species. These studies have demonstrated that a foraminiferal assemblage such as that from Unit D represents shallow near-shore water (less than 100 feet deep) where the salinity possibly was subject to periodic fluctuation.

Rotalia beccarii vars. seem especially adaptable to a wide variety of environments ranging from interdistributary bays where the salinity is very low to the shallow open shelf where the salinity is near normal for open sea water (Lankford, 1959, p. 2078). Bandy (1956, p. 184-185) has shown that "*Rotalia*" *beccarii* var. *tepida* along with *Elphidium* spp. and *Quinqueloculina* spp. are among the most abundant and characteristic western Florida shelf species in water out to 40 feet in depth.

In his study of the Gulf of Mexico between Sabine Pass, Texas, and Grand Cheniere, Louisiana, Bandy (1954, p. 132) reported a relatively great abundance of *Elphidium* spp. and *Rotalia* spp. from the inner shelf between depths of 30 and 130 feet with the greatest concentration between 30 and 55 feet.

Phleger (1954, p. 608) pointed out that "*Rotalia*" *beccarii* vars. and *Elphidium* spp. are typically open gulf species which can adapt to enclosed environments such as bays where they usually occur with a large fauna of arenaceous foraminifers not recorded from the Caloosahatchee Marl on Shell Creek.

The Caloosahatchee foraminifer assemblages need much more detailed study.

The bottom on and in which the fauna of Unit D lived was an unconsolidated calcareous sandy shell marl very similar to that which today occurs off the west coast of Florida at depths of 5 to 20 fathoms (Gould and Stewart, 1955, p. 5).

It is probably worthy of note that *Ostrea sculpturata* which occurs in Units B, D and F cannot be considered an indicator of brackish water conditions. The species occurs in definitely brackish water deposits with *Crassostrea virginica* in the Caloosahatchee type area (DuBar, 1958c), but on Shell Creek and elsewhere it occurs with faunas that are comprised of predominantly normal marine species. It appears then that *Ostrea sculpturata* tolerated a range of salinity from brackish to normal (3.6 percent), being most common in nearly normal open marine waters where *Crassostrea virginica* was rare or absent.

Upper limestone (Unit E): The molluscan fauna of Unit E, although relatively sparse, is similar to that of Unit D and indicates a similar

environmental complex. The sand residue is also very similar to that for Unit D and the greater amount of calcium carbonate is probably attributable to a slower rate of clastic deposition.

The most common molluscan species of the upper limestone (Unit E) are listed below:

Pelecypoda

<i>Anomia simplex</i> d'Orbigny	<i>Fossularca adamsi</i> (Dall)
<i>Arca wagneriana</i> Dall	<i>Phacoides multilineatus</i> Tuomey and Holmes
<i>Chama gardnerae</i> Olsson and Harbison	<i>Phacoides vaccamawensis</i> Dall
<i>Chione cancellata</i> (Linné)	<i>Varicorbula caloosae</i> (Dall)

Gastropoda

<i>Cantharus perplexus</i> Olsson and Harbison	<i>Olivella mutica</i> Say
<i>Crepidula aculeata</i> Gmelin	<i>Turritella apicalis</i> Heilprin
<i>Crucibulum auriculum</i> Gmelin	<i>Turritella perattenuata</i> Heilprin
<i>Marginella pardalis</i> Dall	

Upper marl (Unit F): Lithologically and faunally Unit F varies little throughout its exposed area, apparently having been laid down under uniform environmental conditions.

The molluscan fauna is large and varied, differing from that of Unit D mainly in the absence from it of many of the characteristic Caloosahatchee species. The latter include such forms as *Arca wagneriana*, *Strombus leidyi*, *Cypraea problematica*, and *Turritella perattenuata*, judged to represent tropical species that withdrew southward in late Caloosahatchee time with the lowering of water temperature presumably resulting from initiation of a glacial stage.

TABLE 3. Most Abundant Molluscan Species in Unit F of the Caloosahatchee Marl on Shell Creek
(P = Present, but less than 1 percent)

Species	Stations							
	8-3a	8-3b	6	3-1a	3-1b	1	7	14
	%	%	%	%	%	%	%	%
Pelecypoda								
<i>Anadara transversa</i>	1.2	22.2	13.5	2.5	2.7	9.2	4.4	.....
<i>Anomalocardia caloosana</i> . .	3.0	5.3	1.2	P	P	P	.....	P
<i>Chione cancellata</i>	6.4	35.7	16.4	18.1	8.9	9.4	15.7	19.3
<i>Crassinella acuta</i> and <i>C. lunulata</i>	25.2	.....	24.8	42.5	31.3	23.7	39.2	35.1
<i>Nuculana acuta</i>	P	1.1	1.2	4.2	1.0	5.8	8.5	.....
<i>Parastarte triquetra</i>	27.9	7.5	11.6	.....	.....	P	P	3.9
<i>Phacoides multilineatus</i> . . .	6.5	9.4	15.1	17.5	3.7	3.7	13.4	18.1
<i>Phacoides waccamawensis</i> . .	6.5	9.4	4.9	3.6	3.3	5.4	6.4	1.0
<i>Transennella conradina</i> . . .	25.2	2.6	3.2	.....	1.9	P	1.4	19.0
<i>Varicorbula caloosae</i>	P	1.1	.....	.....	36.3	18.6	P	.....
Gastropoda								
<i>Alabina adamsi</i>	32.9	.....	.....	.....	10.5	.....	P	69.0
<i>Anachis gardnerae</i>	4.0	.....	.....	?	1.3	P	1.8	.....
<i>Caecum</i> spp. . . . .	.....	7.3	10.5	2.8	15.7	50.5	9.0	1.7
<i>Crepidula aculeata</i> . . . . .	.....	9.7	8.2	7.2	5.4	3.5	36.2	.....
<i>Crepidula maculosa</i>	3.8	7.3	2.6	5.9	6.8	4.9	3.6	2.1
<i>Crucibulum auricula</i>	13.7	33.9	18.7	12.6	19.9	10.5	.....	P
<i>Marginella apicina</i>	P	.....	8.7	9.5	.....	?	1.8	1.1
<i>Nassarius</i> cf. <i>N. consensus</i> .	2.0	2.7	5.2	?	1.3	2.0	P	P?
<i>Olivella mutica</i>	21.3	14.5	5.2	17.0	19.9	6.1	12.6	8.7
<i>Retusa canaliculata</i>	13.7	9.7	13.1	4.3	1.3	1.2	P	3.8
<i>Terebra dislocata</i>	?	2.7	.....	2.9	1.3	1.2	.....	P
<i>Turritella subannulata</i>	P	.....	.....	1.7	1.5	9.3	.....	2.1

Mollusks less abundant than those of table 3, but relatively important in Unit F are listed below:

Pelecypoda

<i>Abra aequalis</i> Say	<i>Eucrassatella gibbesi</i> (Toumey and Holmes)
<i>Anadara lienosa</i> (Say)	<i>Fossularca adamsi</i> (Dall)
<i>Anomia simplex</i> d'Orbigny	<i>Glycymeris arata floridana</i> Olsson and Harbison
<i>Brachiodontes exustus</i> (Linné)	<i>Juliacorbula scutata</i> (Gardner)
<i>Cardita arata</i> Conrad	<i>Macrocallista maculata</i> (Linné)
<i>Cardita tridentata</i> (Say)	<i>Macrocallista nimbosa</i> (Solander)
<i>Caryocorbula leonensis</i> Mansfield	<i>Mercenaria campechiensis</i> (Gmelin)
<i>Chama gardnerae</i> Olsson and Harbison	<i>Mulinia lateralis</i> Say
<i>Chione grus</i> (Holmes)	<i>Noetia platyura</i> Dall
<i>Chione latilirata athleta</i> Conrad	<i>Nucula proxima</i> Say
<i>Chlamys fuscopurpureus</i> (Conrad)	<i>Ostrea sculpturata</i> Conrad
<i>Diplodonta acclinis</i> Conrad	<i>Phacoides nassula caloosana</i> Dall
<i>Dosinia elegans</i> Conrad	<i>Plicatula marginata</i> Say
<i>Echinochama cornuta</i> (Conrad)	

Gastropoda

<i>Anachis caloosaensis</i> (Dall)	<i>Eupleura caudata sulcidentata</i> Dall
<i>Busycon contrarium</i> (Conrad)	<i>Fasciolaria apicina</i> Dall
<i>Busycon pyrum floridanum</i> Olsson and Harbison	<i>Gibberulina ovuliformis</i> (d'Orbigny)
<i>Cerithium litharium</i> Dall	<i>Kurtziella</i> sp.a
<i>Cerithium vicinia</i> Olsson and Harbison	<i>Nassarius vibex</i> (Say)
<i>Crepidula plana</i> Say	<i>Odostomia</i> spp.
<i>Conus stearnsi</i> Conrad	<i>Strombus alatus</i> Gmelin
<i>Diodora cayenensis</i> (Lamarck)	<i>Tectonactica pusilla</i> (Say)
	<i>Terebra concava</i> (Say)

Scaphopoda

<i>Cadulus quadridentatus</i> Dall	<i>Dentalium</i> sp.
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The extant molluscan species of Unit F and closely related living representatives of the extinct species are inhabitants of the shallow inner continental shelf and other near-shore environments. Almost all the species thrive best where the salinity is near that for the open sea. Most of the species live abundantly in open ocean water. A few species are best adapted to enclosed bodies of water such as bays or inlets; these include *Transennella conradina*, *Parastarte triquetra*, *Olivella mutica*, and *Nassarius vibex*. Probably all five of these species range into the shallow open ocean. It is possible that Unit F developed under slightly fluctuating environmental conditions where, at times, the water was more shallow and the shore was relatively near. It is also possible that currents could be responsible, in part, for the mixture of bay and shelf species, and especially of shelf and inlet species. However, the excellent preservation of the shells does not seem to allow for much reworking by wave or current action.

Many of the species of Unit F have a bathymetric range from low tide to more than 100 fathoms. These include *Cardita tridentata*, *Chione latilirata*, *Eucrassatella gibbesi*, *Phacoides nassula*, and probably some of the extinct forms. Most of the mollusks, however, seem to have their

peak development in water less than 30 fathoms deep. Hulings (1955) made a study of the molluscan fauna on the shelf off the southeast coast of Texas. He reported faunas from sand and shell bottoms in shallow depths very similar to those found in Unit F. Listed below (table 4) is the fauna Hulings reported from his offshore station 40, where the depth is about 54 feet and the bottom is sandy shell debris.

TABLE 4. Molluscan Fauna Collected off the Coast of Texas at a Depth of 54 Feet (Hulings, 1955)

Species	Percentage	Species	Percentage
<i>Phacoides multilineatus</i>	12.7	<i>Retusa canaliculata</i>	0.9
<i>Tectonatica pusilla</i>	9.7	<i>Seila adamsi</i>	0.9
<i>Chione intapurpurea</i>	7.0	<i>Turbonilla</i> sp.....	0.9
<i>Crassinella lunulata</i>	6.5	<i>Echinochama cornuta</i>	0.8
<i>Phacoides amiantus</i>	6.2	<i>Rhizorus acutus</i>	0.8
<i>Caecum cooperi</i>	4.9	<i>Corbula swiftiana</i>	0.6
<i>Anadara transversa</i>	4.6	<i>Dentalium amaliense</i>	0.6
<i>Ervillia concentrica</i>	4.6	<i>Cerithiopsis subulata</i>	0.4
<i>Gouldia cerina</i>	3.6	<i>Dentalium texasianum</i>	0.4
<i>Semele nuculoides</i>	3.3	<i>Melanella bilineata</i>	0.4
<i>Chama congregata</i>	3.3	<i>Acteon punctostriatus</i>	0.3
<i>Macrocallysta maculata</i>	3.2	<i>Anachis obesa</i>	0.3
<i>Nuculana acuta</i>	3.2	<i>Chione latilirata</i>	0.3
<i>Bittium varium</i>	2.8	<i>Dinocardium robustum</i>	0.3
<i>Caecum glabrum</i>	2.7	<i>Nucula proxima</i>	0.3
<i>Anachis avara</i>	1.7	<i>Odostomia seminuda</i>	0.3
<i>Tellina alternata</i>	1.7	<i>Anomia simplex</i>	0.1
<i>Dosinia discus</i>	1.6	<i>Calyptrea centralis</i>	0.1
<i>Vitrinella</i> sp.....	1.6	<i>Varicorbula krebsiana</i>	0.1
<i>Chione grus</i>	1.2	<i>Eontia bisulcata</i>	0.1
<i>Plicatula gibbosa</i>	1.2	<i>Mitrella lunata</i>	0.1
<i>Rissoina decussata</i>	1.1	<i>Triphora pulchella</i>	0.1

A sample of the upper marl from station SC-1 yielded 23 species of Foraminifera listed in the appendix. The most abundant species are listed below:

<i>Elphidium</i> spp.....	46.0 percent
" <i>Rotalia</i> " <i>beccarii</i> vars.....	21.0 percent
<i>Bolivina pulchella primitiva</i>	7.6 percent
<i>Buccella hanna</i>	6.0 percent
<i>Discorbis</i> spp.....	5.3 percent
<i>Miliolidae</i>	3.8 percent
<i>Cibicides</i> sp.....	3.0 percent

This fauna is similar to that from Unit D (station SC-8) and probably represents approximately the same ecologic conditions.

Lithologically Unit F is a shelly sand similar to that described by Gould and Stewart (1955, p. 5) as occurring off the coast of southwestern Florida between shore and 10 fathoms.

Thus it appears that the fauna of Unit F lived near shore on the inner continental shelf where enough current activity was available to cause some mixture of inlet, bay and shelf species, but not enough to cause significant damage to the shells. It is also possible that slight fluctuations in environmental conditions during the time Unit F was accumulating would account for the mixing of several ecological types. The maximum depth of water was probably no more than 10 to 15 fathoms and possibly less, so that the corresponding shoreline possibly lay below the Wicomico (90 to 100 feet) shoreline, perhaps being the Penholoway shoreline (72 feet above sea level).

Inasmuch as many of the typical and tropical Caloosahatchee species are absent, it is probable that the fauna of Unit F lived in water somewhat cooler than that of any of the underlying Caloosahatchee units. However, most of the species in Unit F, or the apparent progeny, now live in Floridan waters so that water temperature was probably close to that for southern Florida today. The minimum water temperature was probably not less than 65° F., inasmuch as *Chione cancellata* and *Macrocallista maculata* will not survive below that temperature (Pulley, 1955, oral communication).

ALLIGATOR CREEK

The Caloosahatchee faunas that occur along Alligator Creek are similar to those of the lower and middle marls on Shell Creek. However, as pointed out earlier, the section on Alligator Creek is thin and the units of Shell Creek cannot be recognized. In addition, the formation was heavily eroded prior to deposition of the Fort Thompson Formation; thus exposures are discontinuous and lateral tracing of individual units is virtually impossible. Large faunas were collected only from stations D-6 and D-8 although small faunas were collected at stations D-3, D-4, and D-5. Ecological analysis is based primarily on the molluscan species included in these collections.

The most abundant molluscan species in the Caloosahatchee Marl of Alligator Creek are listed in table 5 below.

TABLE 5. Most Abundant Molluscan Species in the Caloosahatchee Marl on Alligator Creek
(P = Present but less than 1.0 percent)

Species	Units			
	D6-1	D4-2	D4-3	D8-2
Pelecypoda				
	%	%	%	%
<i>Abra aequalis</i> (Say).....	P	.....	?	1.6
<i>Anadara improcera</i> (Conrad).....	38.3	P	P	.....
<i>Anomalocardia caloosana</i> (Dall).....	2.9	14.3	17.6	13.5
<i>Cardita arata</i> (Conrad).....	?	P	?	2.8
<i>Caryocorbula leonensis</i> Mansfield.....	2.1	P	P	.....
<i>Chama gardnerae</i> Olsson and Harbison.....	3.5	.....	.....	P
<i>Chione cancellata</i> (Linné).....	6.5	3.6	8.2	7.3
<i>Crassinella lunulata</i> (Conrad) and <i>C. acuta</i> (Dall).....	2.9	4.1	3.8	7.0
<i>Mulinia</i> cf. <i>M. lateralis</i> Say.....	2.9	.....	.....	.....
<i>Laevicardium mortoni</i> Conrad.....	.....	P	.....	3.4
<i>Nucula proxima</i> Say.....	1.3	.....	.....	.....
<i>Nuculana acuta</i> (Conrad).....	8.2	P	P	P
<i>Parastarte triquetra</i> (Conrad).....	1.2	60.7	61.9	6.0
<i>Phacoides anadonta</i> Say.....	P	.....	1.6	.....
<i>Phacoides multilineatus</i> (Tuomey and Holmes).....	4.2	2.8	2.5	26.9
<i>Phacoides nassula caloosana</i> Dall.....	1.6	P	.....	P
<i>Phacoides vaccamawensis</i> Dall.....	2.7	P	P	3.0
<i>Plicatula marginata</i> Say.....	1.9	.....	.....	.....
<i>Transennella conradina</i> (Dall).....	1.1	7.1	5.3	21.3
<i>Varicorbula caloosae</i> (Dall).....	4.6	.....	.....	.....
Gastropoda				
<i>Alabina adamsi</i> (Dall).....	.....	.....	13.3	46.7
<i>Bittium varium</i> Pfeiffer ?.....	7.3	.....	.....	P
<i>Busycon contrarium</i> (Conrad).....	P	.....	1.7	P
<i>Caecum floridanum</i> Stimpson.....	7.3	.....	.....	P
<i>Cantharus</i> sp.—immature.....	3.6	.....	.....	P
<i>Cerithium caloosae</i> Dall.....	.....	1.5	.....	.....
<i>Cerithium litharium</i> Dall.....	.....	11.8	.....	P
<i>Cerithium</i> sp.....	.....	.....	13.3	.....
<i>Crepidula aculeata</i> Gmelin.....	8.1	.....	.....	P
<i>Crepidula maculosa</i> Conrad.....	P	.....	29.1	P
<i>Crucibulum auriculum</i> Gmelin.....	.....	.....	.....	12.1
<i>Diodora</i> cf. <i>D. cayenensis</i> (Lamarek).....	7.3	.....	.....	.....
<i>Marginella amiantula</i> Dall.....	.....	.....	.....	3.6
<i>Marginella pardalis</i> Dall.....	3.6	.....	.....	P
<i>Meioceras cingulatum</i> Dall.....	.....	11.8	.....	2.1
<i>Melongena corona</i> Gmelin.....	.....	.....	3.3	P
<i>Modulus carchedonius</i> (Lamarek).....	3.6	.....	.....	P
<i>Nassarius</i> sp.....	3.6	.....	.....	.....
<i>Nassarius vibex</i> (Say).....	.....	.....	.....	2.2
<i>Olivella mutica</i> Say.....	7.3	.....	13.3	6.8
<i>Retusa canaliculata</i> (Say).....	7.3	60.6	13.3	7.8
<i>Ringicula floridana</i> Dall.....	.....	.....	13.3	.....
<i>Scitia adamsi</i> H. C. Lea.....	7.3	.....	.....	2.4
<i>Strombus alatus</i> Gmelin.....	2.6	.....	.....	.....
<i>Terebra</i> cf. <i>T. concava</i> (Say).....	3.6	.....	.....	?
<i>Turbonilla</i> sp.....	.....	1.5	.....	.....
<i>Turritella subannulata</i> Heilprin.....	3.6	.....	.....	2.4

Additional mollusks, especially larger species, relatively common in the Alligator Creek Caloosahatchee Marl are listed below. (Stations where the species were collected are also indicated.)

Pelecypoda	Stations
<i>Amusium mortoni</i> (Ravenel)	D8-2
<i>Anadara rustica</i> (Tuomey and Holmes)	D6-1, D8-2
<i>Anadara lienosa</i> (Say)	D4-3, D6-1, D8-2
<i>Anadara scalarina</i> (Heilprin)	D6-1
<i>Arca wagneriana</i> Dall	D8-2
<i>Bothrocorbula willcoxi</i> (Dall)	D8-2
<i>Chlamys anteamplicostatus</i> (Mansfield)	D6-1
<i>Chione latilirata athleta</i> Conrad	D6-1
<i>Crassostrea virginica</i> (Gmelin)	D8-2
<i>Dosinia elegans</i> Conrad	D6-1, D8-2
<i>Eucrassatella speciosa</i> (A. Adams)	D6-1
<i>Glycymeris arata floridana</i> Olsson and Harbison	D4-3, D6-1
<i>Macrocallista maculata</i> Linné	D4-3, D6-1
<i>Mercenaria campechiensis</i> (Gmelin)	D6-1, D8-2
<i>Miltha caloosaensis</i> (Dall)	D3-2, D8-2
<i>Noetia platyura</i> (Dall)	D8-2
<i>Panope floridana</i> Heilprin	D6-1
<i>Rangia nasuta</i> (Dall)	D8-2
Gastropoda	
<i>Bulla occidentalis</i> Adams	D8-2
<i>Busycon contrarium</i> (Conrad)	D4-3, D8-2
<i>Busycon rapum</i> (Heilprin) ?	D8-2
<i>Cancellaria conradiana</i> Dall	D8-2
<i>Cantharus perplexus</i> Olsson and Harbison	D8-2
<i>Cerithium caloosaense</i> Dall	D4-2
<i>Cypraea problematica</i> Heilprin	D8-2
<i>Fasciolaria apicina</i> Dall	D4-3
<i>Fasciolaria gigantea</i> Kiener	D6-1
<i>Melongenella corona</i> Gmelin	D4-3, D8-2
<i>Murex brevifrons</i> Lamarck	D6-1
<i>Murex recurvirostris rubidus</i> F. S. Baker	D8-2
<i>Oliva sayana</i> Ravenel	D6-1, D8-2
<i>Pyræzus scalatus</i> (Heilprin)	D8-2
<i>Scaphella floridana</i> Heilprin	D5-5
<i>Turbo castaneus</i> Gmelin	D6-1
<i>Typhis floridanus</i> Dall	D8-2
<i>Vermicularia recta</i> Olsson and Harbison	D6-1

As at most other Caloosahatchee localities the fauna is well preserved and varied. Little evidence of reworking by waves or currents is apparent. It is probable that most of the species lived close to their place of burial.

Comparison of the molluscan species listed above with those of the Shell Creek Caloosahatchee faunas indicates that they lived under essentially the same environmental conditions. The Alligator Creek faunas

seem most closely related to those of the eastern facies of the Shell Creek Unit D marl. Most of the species are characteristic of a shallow water, inner shelf environment. As in the eastern facies of Unit D on Shell Creek, *Anomalocardia caloosana*, *Parastarte triquetra*, *Transennella conradina*, *Olivella mutica*, and *Retusa canaliculata* are among the most abundant species. Typical brackish water species such as *Crassostrea virginica* and *Rangia nasuta* are rare, and with the possible exception of *Amusium mortoni*, deep water, outer shelf species are virtually unknown. The fauna of station D-6 appears to represent slightly deeper water than does the fauna of station D-8. This is to be expected inasmuch as station D-8 lies nearly 3 miles east of station D-6 and was thus somewhat closer to the shore that presumably lay to the east.

The bottom on which the faunas of the Alligator Creek lived was similar to that of the Shell Creek area and seemed to correspond closely to that of the present inner shelf off the coast of southwestern Florida between 5 and 20 fathoms (Gould and Stewart, 1955, p. 5).

FORT THOMPSON FORMATION

GENERAL STATEMENT

All of the deposits of the Charlotte Harbor area which stratigraphically overlie the Caloosahatchee Marl has been assigned to the Fort Thompson Formation in this report. It is possible, however, that the upper 2 to 3 feet of white quartz sands have been reworked relatively recently. Most of the deposits studied are unfossiliferous, unconsolidated quartz sands found below a present elevation of 50 feet above sea level. Unfortunately, the absence of fossils in these beds makes paleoecological interpretation very difficult.

Exposures in the area that carry marine fossils are rare and none are known to occur at an elevation greater than 15 feet above present sea level; thus, all were deposited below the Pamlico shoreline (25 to 30 feet above sea level). As pointed out earlier (DuBar, 1958, and Richards, 1938), the Fort Thompson Formation can be correlated with the making of the Pamlico shoreline.

It is probable that some of the unfossiliferous sands that overlie fossiliferous Fort Thompson sediments were deposited under marine conditions; however, most of the unfossiliferous sands that directly lie on the Caloosahatchee Marl or Tamiami Formation, or lie above the 30-foot contour are probably of nonmarine origin. It is also probable that most of the marine sands were deposited during regression of the Fort Thompson Sea.

The position of the Pamlico shoreline has been roughly delineated by MacNeil (1950); however, more accurate location of this shoreline can be ascertained from study of topographic maps. Modification of the topography by streams such as Peace River and Shell Creek makes exact placement of the shoreline ambiguous. For instance, Shell Creek apparently has cut its valley headward several miles into the Wicomico(?) terrace which lies above the Pamlico shoreline. If this is true, then the Fort Thompson sands exposed along the headwaters of Shell Creek are probably all of nonmarine origin.

All the Fort Thompson exposures that contain marine fossils are located within a few miles of the Pamlico shoreline. If the surface of the Pamlico terrace has not been warped, the difference in elevation between the base of the Pamlico shoreline (25 feet? above sea level) and the elevation of any Fort Thompson fossiliferous bed should approximate the depth of water in which the faunas lived. The elevations of the tops of the fossiliferous units range from sea level to approximately 15 feet above sea level; thus, considering the thickness of the Fort Thompson sediments, the maximum depth of water was probably no greater than 6 fathoms.

The megafossils of the Fort Thompson Formation are well preserved and show little or no evidence of abrasion by wave or current action. Ecological analysis shows that each fauna lived close to shore on the inner continental shelf where the bottom was composed of quartz sand. The salinity ranged from brackish to normal marine (3.6 percent), the temperature was probably similar to that of water off the southwestern coast of Florida today, and the depth was only a few fathoms at the maximum.

Station D-20: Shell-bearing marine Fort Thompson strata are exposed in the walls of a shell pit located about 0.9 mile north of Alligator Creek (NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T. 41 S., R. 23 E.). The excavation at this pit exposes 15.2 feet of sediment of which the lower 9.3 feet contain marine fossils. There are two distinct sandy shell beds divided by a thin band of clay and sand containing only a very few fossils. All the fossils are well preserved and show little evidence of transportation by currents and waves. Mollusks are by far the most abundant fossils; 17 species of pelecypods and 19 species of snails were identified from the lower sandy shell bed; and 8 species of snails and 10 species of clams were identified from the upper shell bed. In addition, the lower shell bed contains a relatively large number of colonial corals near its base.

The most abundant molluscan species in the lower and upper shell beds are listed in table 6.

TABLE 6. Most Abundant Molluscan Species in the Fort Thompson Formation at Station D-20

Species	Stratal Units	
	D20-1	D20-3
	%	%
Pelecypoda		
<i>Anadara transversa</i> (Say).....	6.7	P
<i>Anomia simplex</i> d'Orbigny.....	3.8	P
<i>Chione cancellata</i> (Linné).....	49.2	39.2
<i>Ervilia polita</i> Dall.....	2.2	.....
<i>Mulinia lateralis</i> Say.....	23.8	50.9
<i>Phacoides multilineatus</i> (Tuomey and Holmes).....	11.5	3.0
<i>Trigoniocardia willcoxi</i> (Dall).....	1.1	.....
Gastropoda		
<i>Busycon contrarium</i> (Conrad).....	5.0	2.2
<i>Chrysallida macneili</i> Bartsch.....	5.0	.....
<i>Crepidula aculeata</i> Gmelin.....	5.0	.....
<i>Crepidula maculosa</i> Conrad.....	15.0	.....
<i>Fasciolaria distans</i> Linné.....	.....	1.1
<i>Longchaeus</i> cf. <i>L. marionae</i> Bartsch.....	5.8	17.7
<i>Marginella apicina</i> Menke.....	10.0	18.8
<i>Mormula</i> sp.....	5.0	.....
<i>Olivella mutica</i> Say.....	20.6	18.8
<i>Polynices duplicatus</i> Say.....	.....	3.3
<i>Pyrgiscus</i> sp.....	10.6	.....
<i>Retusa canaliculata</i> (Say).....	.....	17.7
<i>Seila adamsi</i> (H. C. Lea).....	5.0	.....
<i>Terebra dislocata</i> Say.....	5.6	.....
<i>Turbonilla</i> (<i>Chemnitzia</i>) cf. <i>T. admela</i> Bartsch.....	5.6	.....

P=Present, less than 1.0 percent

The molluscan species of station D-20 indicate, for both the lower and upper shell beds, deposition in shallow marine water close to shore. The relative abundance of *Olivella mutica* and *Polynices duplicatus* suggests deposition in an inlet, but absence from the fauna of typical brackish water species that generally are swept by currents into an inlet points to near-shore, open-water deposition.

Elevation at the top of the uppermost shell bed is approximately 10 feet above present sea level, so that water depth at time of deposition probably was no more than 5 fathoms. Distance to the Pamlico shoreline could have been no more than 3 miles.

Station D-7: An exposure of marl on Alligator Creek located about 0.5 mile downstream from the U. S. Highway 41 bridge has yielded a few fossil mollusks which suggest that the deposit should be placed with the Fort Thompson Formation rather than the Caloosahatchee

Marl. The molluscan species from the lowermost bed at this exposure are listed below:

Pelecypoda

Anadara transversa (Say)
Anomia simplex d'Orbigny
Chione cancellata (Linné)
Chlamys irradians (Lamarck)
Mercenaria campechiensis (Gmelin)

Gastropoda

Busycon contrarium (Conrad)

The fauna is rather sparse for precise ecological analysis, but suggests a high salinity bay environment and very shallow depths. The overlying sandy limestone resembles intertidal beach rock as described by Ginsberg (1953). The top of the fossiliferous bed is less than 2 feet above present sea level.

Warm Mineral Springs: The deposits at Warm Mineral Springs typically include a lowermost fresh water marl and an overlying marine shell marl. In some places a brackish water oyster biostrome lies between the marine and the fresh water units. All the beds contain vertebrate bones. The molluscan species identified from the marine shell bed are listed below (table 7):

TABLE 7. Check List of Molluscan Species from Warm Mineral Springs, Sarasota County, Florida

Pelecypoda		Gastropoda	
<i>Abra aequalis</i> (Say).....	R	<i>Actaeon</i> sp.....	R
<i>Anadara transversa</i> (Say).....	FC	<i>Anachis</i> (<i>Costanachis</i>) <i>obesus</i>	
<i>Anadara</i> sp. a.....	R	(C. B. Adams) sub sp?.....	R
<i>Anomalocardia caloosana</i> (Dall)...	C	? <i>Anachis</i> sp. a.....	FC
<i>Cardita</i> sp. very close to <i>C. arata</i>		<i>Busycon contrarium</i> (Conrad).....	R
(Conrad) of the Caloosahatchee		<i>Busycon pyrum</i> Dillwyn sub sp. a?..	R
Marl.....	R	<i>Cerithium muscarum</i> Say.....	R
<i>Chione cancellata</i> (Linné).....	A	<i>Crepidula plana</i> Say.....	FC
<i>Laevicardium mortoni</i> Conrad.....	R	<i>Fasciolaria apicina</i> Dall ?.....	R
<i>Macrocallista nimbosa</i> Solander....	R	Has protoconch sculpture of the	
<i>Mulinia lateralis</i> Say.....	C	Caloosahatchee species	
<i>Nucula proxima</i> Say.....	R	<i>Fasciolaria distans</i> Linné.....	R
<i>Parastarte triquetra</i> Conrad.....	A	<i>Longchaeus</i> cf. <i>L. marionae</i> Bartsch	R
<i>Phacoides multilineatus</i> Tuomey		<i>Marginella apicina</i> Menke.....	R
and Holmes.....	C	<i>Melongena corona</i> Gmelin.....	R
<i>Plicatula</i> sp.....	R	<i>Nassarius bidentatus</i> (Emmons)	
<i>Tagelus divisus</i> (Spengler).....		slender form.....	R
<i>Tellidora cristata</i> Recluz.....	R	<i>Nassarius vibex</i> (Say).....	R
<i>Tellina sayi</i> Dall.....	R	<i>Nassarius</i> sp.....	R
<i>Trachycardium isocardia</i> (Linné) ?..	?-R	<i>Olivella mutica</i> (Say) rather slender,	
<i>Transennella conradina</i> (Dall).....	A	so perhaps is <i>O. pusilla</i> Marrat..	R
<i>Transennella</i> cf. <i>T. simpsoni</i> Dall..	R	<i>Polynices duplicatus</i> Say.....	R
<i>Venus campechiensis</i> Gmelin.....	R	<i>Pyrgiscus</i> cf. <i>P. sisphusi</i> Bartsch..	R
		<i>Pyrgiscus</i> cf. <i>P. tellusae</i> Bartsch..	R
		<i>Pyrgiscus</i> sp. a.....	R
		<i>Retusa canaliculata</i> Say.....	R
		<i>Strombus alatus</i> Gmelin (immature)	R
		? <i>Terebra</i> sp.....	R
		<i>Turbonilla</i> cf. <i>T. alcmene</i> Bartsch..	R
		<i>Turbonilla</i> sp. a.....	R

A = Abundant

C = Common

FC = Fairly Common

R = Rare

ACLINE FAUNA

Molluscan species collected from spoil piles along the sides of a shell pit located about 1 mile southwest of Acline in the Punta Gorda SE quadrangle were first studied by Helen Tucker and Druid Wilson (1932-33). The fauna included some Caloosahatchee species as well as some restricted to the Miocene, and several new species. Inasmuch as the pit was filled with water, it was impossible for Tucker and Wilson to determine the stratigraphic relations. Consequently, it could not be ascertained if the collections included assemblages from more than one stratum of different ages, or if the fauna were intermediate in age between the Miocene and the Caloosahatchee Marl. It is interesting to note that several other pits located near the one yielding the "Acline fauna" contain sandy and argillaceous facies of the Tamiami Formation with the usual *Ostrea-Encope-Balanus* fauna. According to Druid Wilson the pit containing the "Acline fauna" is deeper than the other pits and thus has penetrated a stratum not reached in the others (personal communication, 1958).

Lately, another pit (station D-22) has been opened within 800 feet of the "Acline fauna" pit, and strangely has yielded only the usual *Ostrea-Encope-Balanus* fauna. Druid Wilson has postulated a facies change between the two pits (personal communication, 1958), but the distance seems insufficient to allow for so great a faunal change. More likely the new pit was not dredged deeply enough to encounter the Acline fauna.

In 1958, the U.S. Geological Survey had the "Acline fauna" pit drained and Druid Wilson with Stanley Olsen of the Florida Geological Survey, made large collections from the walls of the pit. These collections are currently being studied by Mr. Wilson at the National Museum.

Collections made by Charles Locklin from the spoil piles of the "Acline fauna" pit, and perhaps several others in the immediate vicinity, were donated to the Florida Geological Survey where, in 1958, they were studied by the writer. Seventy subspecies and species of pelecypods and 105 species and subspecies of gastropods were identified and are listed with their geologic ranges in table 8.

Casual study of this faunal list immediately discloses that the fauna is ecologically and stratigraphically mixed. Thirty-four species and subspecies are known only from the Acline fauna, 17 appear to be restricted to the Miocene, 72 are post-Miocene, 52 range from the Miocene into the younger strata, 41 are restricted to the Caloosahatchee Marl, 50 range into the Recent, and 2 species are post-Caloosahatchee.

It appears that this collection includes species from the Fort Thompson Formation, the Caloosahatchee Marl, and a facies of the Tamiami Formation. It is possible also that a fauna intermediate in age between that of the Tamiami Formation and the Caloosahatchee Marl is represented.

TABLE 8. Acline Molluscan Check List

Species	Geologic Range					
	A	M	Pl	C	P	R
Pelecypoda						
<i>Anadara campyla</i> (Dall)				X		
<i>Anadara chiriquiensis</i> (Gabb)		X				
<i>Anadara lienosa</i> (Say)		X	X	X	X	X
<i>Anadara rustica</i> (Tuomey and Holmes)			X	X		
<i>Anadara scalarina</i> (Heilprin)				X		
<i>Anadara</i> sp. A—similar to <i>A. improcera</i> (Conrad)	X					
<i>Anomalocardia caloosana</i> (Dall)			X	X	X	
<i>Anomia simplex</i> d'Orbigny		X	X	X	X	X
<i>Arca aquila</i> Heilprin				X		
<i>Arca wagneriana</i> Dall				X		
<i>Astarte</i> sp.	X					
<i>Bothrocorbula willcoxi</i> (Dall)				X		
<i>Cardium acclinensis</i> Tucker and Wilson	X					
<i>Cardita arata</i> (Conrad)		X	X	X	X	
<i>Cardita tridentata</i> (Say)		X	X	X	X	X
<i>Chama gardnerae</i> Olsson and Harbison		X	X	X		
<i>Chama heilprini</i> Cossman				X		
<i>Chama willcoxi</i> Dall				X		
<i>Chione cancellata</i> (Linné)		?	X	X	X	X
<i>Chione cribaria</i> Conrad		X	X	X		
<i>Chione latilirata athleta</i> Conrad		X	X	X		X
<i>Chione</i> cf. <i>C. ulocyma</i> Dall		X				
<i>Chlamys comparilis</i> (Tuomey and Holmes)		X	?	X		
<i>Chlamys irradians</i> Lamarek			X	X	X	X
<i>Chlamys jeffersonius</i> Say		X				
<i>Chlamys solarioides</i> (Heilprin)			X	X		
<i>Chlamys</i> sp. A.	X					
<i>Crassostrea virginica</i> (Gmelin)			?	X	X	X
<i>Diplodonta acclinis</i> Conrad		X	X	X		
<i>Divaricella</i> sp.	X					
<i>Dosinia elegans</i> Conrad		X	X	X	X	X
<i>Echinochama cornuta</i> (Conrad)		X	X	X	X	X
<i>Eucrassatella speciosa</i> (A. Adams)		X	X	X	X	X
<i>Glycymeris americana</i> (Defrance)		X	X	X	X	X
<i>Hemimertis magnoliana</i> (Dall)		X				
<i>Laevicardium laevigatum wagnerianum</i> Olsson and Harbison?				X		

TABLE 8. (Continued)

Species	Geologic Range					
	A	M	Pl	C	P	R
Pelecypoda (Continued)						
<i>Lucina pennsylvanica</i> Linné				X	X	X
<i>Macrocallista</i> sp. A (new?)	X					
<i>Macrocallista nimbose</i> Solander			X	X	X	X
<i>Mercenaria campechiensis</i> (Gmelin)		X	X	X	X	X
<i>Mulinia congesta</i> (Conrad)		X	X	?		
<i>Mulinia sapotilla</i> Dall				X		
<i>Mytilus conradiana</i> d'Orbigny		X				
<i>Noetia ponderosa</i> (Say)				?	X	X
<i>Nucula proxima</i> Say		X	X	X	X	X
<i>Nuculana acuta</i> (Conrad)		X	X	X	X	X
<i>Ostrea meridionalis</i> Heilprin		X	X			
<i>Ostrea sculpturata</i> Conrad		X	X	X	?	
<i>Ostrea</i> sp. A.	X					
<i>Ostrea tamiamiensis</i> subsp. A	X					
<i>Parastarte triquetra</i> (Conrad)		X	X	X	X	X
<i>Pecten raveneli</i> Dall				X	X	X
<i>Pedalion kecia</i> Tucker and Wilson	X					
<i>Phacoides disciformis</i> (Heilprin)		X	X	X	X	X
<i>Phacoides radians</i> (Conrad)			X	X	X	X
<i>Phacoides</i> sp.	X					
<i>Phacoides trisulcatus</i> (Conrad)		X	X	X	X	X
<i>Phacoides tuomeyi</i> Dall		X				
<i>Plicatula marginata</i> Say		X	X	X	?	
<i>Rangia nasuta</i> (Dall)				X		
<i>Semele bellastrata</i> Conrad		X	X	X	X	X
<i>Tellidora lunulata</i> Holmes			X	X		
<i>Tellina</i> cf. <i>T. dinomera</i> Dall				X		
<i>Tellina</i> cf. <i>T. sayi</i> Deshayes				X		
<i>Tellina</i> sp.	X					
<i>Trachycardium muricatum</i> (Linné)			?	X	X	X
<i>Trachycardium oedalius</i> (Dall)		?	X	X		
<i>Transennella</i> sp.	X					
<i>Trigonocardia columba</i> (Heilprin)				X		
<i>Varicorbula caloosae</i> (Dall)				X		

TABLE 8. (Continued)

Species	Geologic Range					
	A	M	Pl	C	P	R
Gastropoda						
<i>Anachis caloosaensis</i> (Dall)				X		
<i>Architectonica nobilis</i> Röding		X	X	X	X	X
<i>Astraea scolopax</i> Olsson and Harbison				X		
<i>Bulla occidentalis</i> Adams			?	X	X	X
<i>Bulla striata</i> Brugiere			?	X		
<i>Busycon contrarium</i> (Conrad)		X	X	X	X	X
<i>Busycon echinatum</i> (Dall)				X		
<i>Busycon planulatum</i> (Dall)				X		
<i>Busycon pyrum floridanum</i> Olsson and Harbison				X		
<i>Busycon rapum</i> (Heilprin)				X		
<i>Cancellaria</i> sp. A	X					
<i>Cancellaria tabulata</i> Gardner and Aldrich		X				
<i>Cancellaria venusta</i> Tuomey and Holmes		X	X			
<i>Cantharus clarksvillensis</i> (Mansfield)		X				
<i>Cantharus multangulata</i> (Philippi)			X	X	?	X
<i>Cantharus perplexus</i> Olsson and Harbison				X		
<i>Cerithium caloosaense</i> Dall				X		
<i>Cerithium coccodes</i> Dall				X		
<i>Cerithium vicinia</i> Olsson and Harbison				X		
<i>Clathrodrillia ebinina</i> (Dall)				X		X
<i>Clathrodrillia perspirata</i> (Dall) ?				X		
<i>Colubraria lanceolata acclinica</i> Tucker and Wilson				X		
? <i>Columbella</i> sp. A	X					
<i>Conus adversarius</i> Conrad		X	X	X		
<i>Conus</i> cf. <i>C. daucus</i> Hwass				X	X	X
<i>Conus floridanus</i> Gabb		X	?	X	X	X
<i>Conus spurioides</i> Olsson and Harbison				X		
<i>Conus waccamawensis</i> B. Smith		X	X	X		
<i>Conus waccamawensis</i> subsp. A new ?	X					
<i>Crepidula aculeata</i> Gmelin		X	X	X	X	X
<i>Crepidula fornicata</i> Say		X	X	X	X	X
<i>Crepidula plana</i> Say		X	X	X	X	X
<i>Crucibulum auriculum</i> Gmelin		X	X	X		
<i>Crucibulum</i> cf. <i>C. imbricatum</i> (Sowerby)		X		X		
<i>Crucibulum multilineatum</i> (Conrad)		X		X		
<i>Crucibulum spinosum</i> Sowerby ?						
" <i>Cythara</i> " sp. A	X					
<i>Cymatosyrinx lunata</i> (Lea)		X	X	X		

TABLE 8. (Continued)

Species	Geologic Range					
	A	M	Pl	C	P	R
Gastropoda (Continued)						
<i>Cymatosyrinx lunata aclinica</i> Tucker and Wilson	X					
<i>Cymatosyrinx</i> sp. A	X					
<i>Cypraea carolinensis floridana</i> Mansfield		X				
? <i>Dorsanum plicatile</i> (Böse)		X				
<i>Fasciolaria apicina</i> Dall			X	X		
<i>Fasciolaria distans</i> Linné					X	X
<i>Fasciolaria gigantea</i> Kiener			X	X	X	X
<i>Fasciolaria scalarina</i> Heilprin				X		
<i>Fusinus caloosaensis</i> Heilprin		?	?	X		
<i>Fusinus caloosaensis</i> subsp. A	X	?				
<i>Hanetia mengeana</i> (Dall)				X		
<i>Hanetia vaughani aclinensis</i> (Tucker and Wilson)	X					
<i>Helisoma conanta</i> (Dall)				X		
<i>Lemintina</i> sp.	X					
<i>Marginella apicina</i> Menke			X	X		
<i>Marginella eulima</i> Dall				X		
<i>Marginella mansfieldi</i> (Tucker and Wilson)	X					
<i>Marginella pardalis</i> Dall			X	X		
<i>Marginella precursor</i> Dall		X	X	X		
<i>Marginella</i> sp. A	X					
<i>Melongena corona</i> Gmelin				X	X	X
<i>Mitra heilprini saginata</i> Tucker and Wilson	X					
<i>Modulus carchedonius</i> (Lamarek)				X	?	X
<i>Murex macgintyi</i> M. Smith				X	X	X
<i>Murex pomum</i> Gmelin		X	?	X	X	X
<i>Murex recurvirostris rubidis</i> F. C. Baker				X	X	X
<i>Murex salleanus</i> A. Adams				X		
<i>Nassarius vibex</i> (Say)			X	X	X	X
<i>Natica canrena</i> (Linné) Möhrh		X	X	X	X	X
<i>Natica guppyana</i> Toulà		X				
<i>Oliva sayana</i> Ravenel		X	X	X	X	X
<i>Oliva sayana immortua</i> Pilsbry and Brown		X				
<i>Oliva</i> sp.	X					
<i>Pyrazus scalatus</i> (Heilprin)				X		
<i>Pyrazus scalatus</i> subsp. A	X					
<i>Petalonchus sculpturatus</i> H. C. Lea		X				
<i>Physa meigsii</i> Dall				X		
<i>Polynices duplicatus</i> Say		X	X	X	X	X

TABLE 8. (Continued)

Species	Geologic Range					
	A	M	Pl	C	P	R
Gastropoda (Continued)						
<i>Polynices</i> cf. <i>P. duplicatus</i> Say		X	X	X	X	X
<i>Polynices subclausa</i> Sowerby		X				
? <i>Pseudosalpinx</i> sp. A	X					
<i>Rhinoclavis caloosensis</i> (Dall)				X		
<i>Rhinoclavis</i> sp.	X					
<i>Scaphella floridana</i> Heilprin				X		
<i>Sedilia</i> sp. A	X					
<i>Strombus alatus</i> Gmelin		X	?	X	X	X
<i>Tegula fasciatum</i> (Born)				X		
<i>Terebra dislocata</i> Say		X	X	X	X	X
<i>Terebra</i> sp. A	X					
<i>Terebra</i> sp. C	X					
<i>Terebra unilineata</i> Conrad		X				
<i>Terebra unilineata</i> subsp. A	X					
<i>Trophon lepidota</i> (Dall)				X		
<i>Turbo rhectogrammicus</i> Dall				X		
<i>Turritella apicalis</i> Heilprin				X		
<i>Turritella cookei gladeensis</i> Mansfield		X				
<i>Turritella pontoni</i> Mansfield		X				
<i>Turritella pontoni</i> subsp. A new?	X					
<i>Turritella</i> n. sp. A ?	X					
<i>Turritella subannulata</i> subsp. A	X					
<i>Turritella</i> cf. <i>T. wagneriana</i> Olsson and Harbison				X		
<i>Urosalpinx subsidus</i> Dall				X		
<i>Vermicularia recta</i> Olsson and Harbison				X		
<i>Viviparus georgianus</i> (Lea)				X	X	X
<i>Xancus scolymoides</i> Dall				X		
<i>Xenophora conchyliophora</i> Born				X	?	X

A —Known only from Acline (age in doubt)

M—Miocene

Pl—Pliocene (includes Waccamaw and Croatan formations)

C —Caloosahatchee Marl

P —Pleistocene (other than Caloosahatchee Marl)

R —Recent

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APPENDIX

STRATIGRAPHIC SECTIONS

Station SC-1. NE¼NE¼SW¼ sec. 29, T. 40 S., R. 25 E., Bermont quadrangle, Charlotte County, Florida. Section measured in Karnes Shell Corporation pit approximately 20 yards west of Shell Creek. Color symbols (10 yr 5/4) refer to National Research Council, Rock Color Chart.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
4	Sand, quartz (99 percent), fine to medium, subangular to angular, clear, largest grains rounded and slightly frosted, unconsolidated, well sorted, white; no fossils observed.....	3.0
3c	Sand, quartz, medium, subrounded, 1-3 percent coarse grains well rounded, very slightly consolidated, fairly well sorted, moderate yellowish brown (10 yr 5/4); no fossils observed.....	2.8
3b	Sand, quartz, medium, subangular to subrounded, clear, slightly consolidated, pale, yellowish brown (10 yr 6/2); no fossils observed.....	5.0
3a	Sand, quartz, medium, subangular, clear, coarse grains subrounded frosted, slightly consolidated, dark yellowish brown (10 yr 4/2); stained black; no fossils observed.....	0.5

Unconformity

Caloosahatchee Marl

Unit F

2	Shell marl, marine, sandy, quartz grains medium, subangular to subrounded, clear, slightly consolidated, very pale orange (10 yr 8/2); very fossiliferous, mollusks abundant, well preserved, white, forams common, ostracodes rare.....	9.7
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Unit E

1	Limestone (collected from spoil pile, apparently underlies bed 1, but not exposed) marine, sandy, dense, hard, gray (N8) when fresh, yellowish brown when weathered; insoluble residue 49.0 percent by weight, quartz sand, fine to medium, some grains slightly frosted, subangular to subrounded, clay 10 percent (est.); very fossiliferous, mollusks abundant, well preserved.....	1.0
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Station SC-2. SW¼SW¼NW¼ sec. 29, T. 40 S., R. 25 E., Bermont quadrangle, Charlotte County, Florida. Section measured in Karnes Shell Corporation pit approximately 30 yards south of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
6	Sand, quartz, fine to medium, subangular to subrounded, clear, well sorted, unconsolidated, white; no fossils observed.....	2.0
5b	Sand, quartz, medium, subrounded, clear, largest grains frosted, well sorted, slightly consolidated, dark yellowish orange (10 yr 6/6); no fossils observed.....	2.0
5a	Sand, quartz, fine to medium, subangular to subrounded, clear, largest grains frosted, well sorted, slightly consolidated, very pale orange, (10 yr 8/2); no fossils observed.....	7.0

Unconformity

Caloosahatchee Marl

Unit F

- | | | |
|---|--|-----|
| 4 | Shell marl, marine, sandy, quartz grains medium, subangular to subrounded, clear, largest grains frosted, fine, rounded black phosphate grains, grayish orange (10 yr 7/4); very fossiliferous, well preserved, white, mollusks abundant. | 4.0 |
| 3 | Shell marl, marine, sandy, quartz, subangular, clear, largest grains rounded and frosted, well sorted, slightly consolidated, very light gray (5 yr N8); very fossiliferous, well preserved, white, mollusks abundant, echinoid spines common, forams common including <i>Elphidium</i> sp. | 5.0 |

Unit E

- | | | |
|---|--|-----|
| 2 | Limestone, marine, sandy, hard, compact, medium blue-gray (5B 5/1); very fossiliferous, well preserved, random orientation, gray to white, little breakage, insoluble residue 48.3 percent by weight, 90-95 percent sand, mostly subangular to subrounded quartz, small percentage black rounded phosphate (1 percent), clay 5-8 percent. | 1.0 |
|---|--|-----|

Unit D

- | | | |
|---|--|----|
| 1 | Marl, sandy, quartz, fine to medium with 1-3 percent coarse grains, all subrounded to rounded, slightly frosted, calcareous, some small aragonite (?) crystals, slightly consolidated, very light gray (5 yr N8) to very pale orange (10 yr 8/2); mollusks abundant, well preserved, ostracodes rare (collected beneath water from floor or pit) | ?? |
|---|--|----|

Station SC-3. NW¼NE¼SE¼ sec. 30, T. 40 S., R. 25 E., Bermont quadrangle, Charlotte County, Florida. Section measured in Karnes Shell Corporation pit, 10 yards south of the bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
3	Sand, quartz, fine to medium, subangular to subrounded, clear, well sorted, unconsolidated, white; no fossils observed.	3.1
2c	Sand, quartz, medium, subrounded, clear, largest grains frosted, fairly well sorted, silt (5 percent), slightly consolidated, light brown (5 yr 5/6); no fossils observed.	1.7
2b	Sand, quartz, medium, subangular, clear, largest grains subrounded and frosted, well sorted, slightly more consolidated than 2c, pale yellowish brown (10 yr 6/2); no fossils observed.	5.0
2a	Sand, quartz, medium, angular to subangular, clear, largest grains subrounded and frosted, well sorted, moderately consolidated, pale yellowish brown (10 yr 6/2); no fossils observed.	0.4

Unconformity

Caloosahatchee Marl

Unit F

- | | |
|----|---|
| 1b | Shell marl, marine, sandy, quartz (95-98 percent) medium, subrounded, clear, largest grains rounded and frosted, well sorted, |
|----|---|

	moderately consolidated, few fine black, rounded phosphate grains, grayish orange (10 yr 7/4); very fossiliferous, well preserved, while mollusks abundant, forams rare, ostracodes rare, and echinoid spines rare to common	4.8
1a	Shell marl, marine, sandy, quartz (95-98 percent) medium, subangular to subrounded, clear, largest grains rounded and frosted, 1-2 percent fine rounded black phosphate, well sorted, slightly consolidated, ivory light gray (5 yr N8); very fossiliferous, well preserved, white mollusks abundant, echinoid spines and forams rare (probably equivalent to limestone below)	5.0

Station SC-4. NE¼NE¼SW¼ sec. 30, T. 40 S., R. 25 E., Bermont quadrangle, Charlotte County, Florida. Section on right bank of Shell Creek.

The upper limestone of the Caloosahatchee Marl overlies the middle marl. No collections were made here.

Station SC-5. SW¼NE¼SW¼ sec. 30, T. 40 S., R. 25 E., Bermont quadrangle Charlotte County, Florida. Section measured on right bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Covered		
3 Sand		12.7
Caloosahatchee Marl		
Unit E		
2	Limestone, marine, sandy, hard, lightly porous, light gray to white on fresh surface (N8, N9), yellowish gray (5Y 8/1) to dark yellowish orange (10 yr 6/6) when weathered; very fossiliferous, well preserved, white, mollusks common. Insoluble residue 44.1 percent by weight, quartz sand 98 percent; fine, subangular, clear, clay 2 percent; well sorted.....	1.8
Unit D		
1	Shell marl, marine, calcareous, sandy, quartz, medium, subangular to subrounded, clear, few small aragonite (?) nodules, occasional fine, black phosphate grains, well sorted, slightly consolidated, grayish orange (10 yr 7/4); very fossiliferous, well preserved, white to gray, mollusks abundant, forams and ostracodes rare, echinoid spines fairly common.....	6.0

Station SC-6. SE¼NW¼SW¼ sec. 30, T. 40 S., R. 25 E., Bermont quadrangle, Charlotte County, Florida. Section measured on right bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Covered		
4 Sand		11.6
Caloosahatchee Marl		
Unit F		
3	Shell marl, marine, sandy, quartz (96-97 percent), medium, subangular, clear, largest grains subrounded and frosted, medium black phosphate (3-4 percent), well sorted, slightly consolidated,	

	pale yellowish brown (10 yr 6/2); very fossiliferous, well preserved, white mollusks abundant, forams rare.....	4.5
Unit E		
2	Limestone, marine, sandy, hard, dense, moderate yellowish brown (10 yr 5/4); fossiliferous	1.8
Unit D		
1	Marl, marine, calcareous, sandy, quartz grains medium, subrounded; slightly frosted, largest grains rounded and frosted, weathered muscovite flakes rare, well sorted, slightly consolidated, moderate yellowish brown (10 yr 5/4); very fossiliferous, well preserved, white, mollusks abundant.....	7.0

Section SC-7. SE¼NW¼NW¼ sec. 28, T. 40 S., R. 25 E., Bermont quadrangle, Charlotte County, Florida. Section on left bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
3	Sand, quartz, medium, subrounded, unconsolidated, well sorted, white; no fossils observed.....	0.5
2	Sand, quartz, medium, subrounded, unconsolidated, well sorted, tan; no fossils observed.....	5.5
Unconformity		
Caloosahatchee Marl		
Unit F		
1	Shell marl, sandy, quartz, medium, subrounded, largest grains more rounded and frosted, fairly well sorted, unconsolidated, pale yellowish brown (10 yr 6/2); very fossiliferous, mollusks well preserved and abundant, no foraminifers or ostracodes observed	3.0+

Station SC-8. NE¼SE¼SE¼ sec. 25, T. 40 S., R. 24 E., Bermont quadrangle, Charlotte County, Florida. Section measured on left bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
4	Sand, quartz, fine to medium, subangular, slightly indurated, grayish orange (10 yr 7/4); no fossils observed	2.0
Unconformity		
Caloosahatchee Marl		
Unit F		
3c	Shell marl, marine, sandy, quartz grains medium, subangular to subrounded, clear to slightly frosted, well sorted, few grains of blue chert, slightly consolidated, pale yellowish brown (10 yr 6/2); very fossiliferous, well preserved gastropod and pelecypod shells abundant, random orientation, no foraminifers or ostracodes observed	3.0
3b	Sand, marine, quartz, medium, subangular to subrounded, well sorted, slightly consolidated, tan to red-brown, weathers brown on surface; sparsely fossiliferous, mostly <i>Transennella conradina</i>	

	well preserved.....	0.9
3a	Shell marl, marine, sandy, quartz grains, medium, subangular to subrounded, smaller grains clear, larger grains frosted, 1 percent medium grained black phosphate, poorly sorted, pale yellowish brown (10 yr 6/2); very fossiliferous, well preserved, pelecypod valves slightly lineated N 20° W	1.5
Unit E		
2	Limestone, marine, hard, dense, sandy, moderate yellowish brown (10 yr 5/4); very fossiliferous, insoluble residue 36.5 percent by weight, quartz sand fine to medium, subangular to subrounded, slightly frosted, clay 2 to 3 percent of residue.....	1.0
Unit D		
1b	Shell marl, marine, sandy, quartz, grains medium, subangular to subrounded, clear, fairly well sorted, moderately yellowish brown (10 yr 5/4); very fossiliferous, mollusks abundant, foraminifers, ostracodes and echinoid spines rare.....	1.5
1a	Marl, marine, calcareous, sandy, fine grained, subangular, clear, medium grained black phosphate (1 percent); small ½ mm., aragonite (?) needles (2 percent), very pale orange (10 yr 8/2); very fossiliferous, mollusks abundant, foraminifers and ostracodes common	3.0

Station SC-9. NE¼SW¼SE¼ sec. 25, T. 40 S., R. 24 E., Bermont quadrangle, Charlotte County, Florida. Section on right bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Covered		
3	Sand	4.5
Caloosahatchee Marl		
Unit E		
2	Limestone, sandy, hard, gray; mollusks common.....	1.0
Unit D		
1	Shell marl, calcerous, sandy, quartz medium, subrounded, coarse quartz grains (1-2 percent) rounded, frosted, unconsolidated, fine aragonite (?) crystals (2-3 percent) fine, black phosphorite (1-2 percent), pale yellow-brown (10 yr 6/2); very fossiliferous, mollusks abundant, well preserved, foraminifers, ostracodes, and echinoid spines common.....	4.5

Station SC-10. NW¼SW¼SE¼ sec. 25, T. 40 S., R. 24 E., Bermont quadrangle, Charlotte County, Florida. Section measured on right bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Covered		
4	Sand	9.0
Caloosahatchee Marl		

Unit D

- 3 Shell marl, marine, sandy, quartz grains medium, subangular to subrounded, clear, occasional medium grained, rounded black phosphate, rare, small aragonite (?) needles; light olive gray (5 yr 6/1); mollusks abundant, well preserved, forams common. 3.0

Unit C

- 2 Limestone, marine, hard, porous, sandy, phosphate, quartz grains fine to medium, with few large grains, small grains angular to subangular, clear, largest grains subrounded and frosted, clay 5 percent (?), white (N9) on fresh surface, strained yellow-brown, insoluble residue 16.5 percent by weight; mollusks abundant and well preserved including *Arca wagneriana* and *Turritella apicalis* 1.0

Unit B

- 1 Marl, marine, sandy, calcareous, moderately consolidated, quartz grains fine to medium, subrounded, clear, rare, fine, black rounded phosphate grains, fairly well sorted, light olive gray (5 yr 6/1); very fossiliferous, mollusks abundant, well preserved *Chione cancellata* and *Rangia nasuta* common, forams rare 5.0(?)
(Hard limestone ledge observed
4-5 feet below water level.)

Station SC-11. SE¼SW¼ sec. 25, T. 40 S., R. 24 E., Bermont quadrangle, Charlotte County, Florida. Section measured on right bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Covered		
3	Sand	10.0
Caloosahatchee Marl		
Unit A		
2	Limestone, conglomeratic, sandy, shell hash in matrix; most shells occur as molds causing limestone to be very porous; matrix yellow-brown (10 yr 8/2); on fresh surface, stained with limonite; pebbles 20-50 mm., pale yellow-brown (10 yr 6/2) containing tiny white mollusk shells, few black grains of phosphorite (1-2 mm.). Insoluble residue 9.0 percent by weight, of which 25 percent is sand, 75 percent clay and silt.	2.5
Miocene		
Tamiami Formation		
1	Marl, argillaceous, fairly well consolidated, porous, cream to yellow-brown; fossils sparse. Insoluble residue 24.0 percent by weight	6.0

Station SC-12. SW¼NW¼SW¼ sec. 25, T. 40 S., R. 24 E., Bermont quadrangle, Charlotte County, Florida. Section measured on left bank of Shell Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
3	Sand, quartz, medium, subangular to subrounded, well sorted,	

	less than 5 percent phosphorite and other dark minerals unconsolidated, white (5 yr N9); no fossils observed	7.5
2	Sand, quartz, medium, subangular to subrounded, fairly well sorted, dark yellow-brown (10 yr 4/2); no fossils observed	0.5
Unconformity		
Miocene		
Tamiami Formation		
1	Clay, sandy, calcareous, phosphatic, moderately consolidated, tan to cream; mollusks common.....	3.5
Station SC-13. NW¼NW¼NW¼ sec. 26, T. 40 S., R. 24 E., Cleveland quadrangle, Charlotte County, Florida. Section measured on left bank of Shell Creek.		

Bed	Description	Thickness (feet)
-----	-------------	---------------------

Pleistocene

Fort Thompson Formation

- | | | |
|---|--|-----|
| 2 | Sand, quartz, medium, unconsolidated, tan to gray; no fossils observed | 7.5 |
|---|--|-----|

Miocene

Tamiami Formation

- | | | |
|---|--|-----|
| 1 | Marl, calcareous, argillaceous, dense, well consolidated, quartz sand, medium (2-3 percent), rounded black phosphorite grains up to 10 mm., very pale yellow-orange (10 yr 8/2); fossil fragments white, not common..... | 4.0 |
|---|--|-----|

Station SC-14. SE¼SE¼ sec. 36, T. 40 S., R. 25 E., northwest of lake, Bermont quadrangle, Charlotte County, Florida.

Station SC-14 has fauna similar to that recorded by Mansfield (1939) at Bermont and appears to be uppermost Caloosahatchee marl.

Station D-2. NE¼NE¼ sec. 28, T. 41 S., R. 23 E., Punta Gorda quadrangle, Charlotte County, Florida. Section located on right bank of Alligator Creek approximately 150 yards downstream from the dam.

Bed	Description	Thickness (feet)
-----	-------------	---------------------

Pleistocene

Fort Thompson Formation

- | | | |
|---|---|-----|
| 5 | Sand, quartz, medium, unconsolidated, white; no fossils observed | 2.0 |
| 4 | Sand, quartz, medium, unconsolidated, dark brown; no fossils observed | 1.0 |
| 3 | Sand, quartz, medium to coarse, subrounded, unconsolidated, brown, mottled orange; no fossils observed..... | 1.5 |

Unconformity

Caloosahatchee Marl

- | | | |
|---|---|-----|
| 2 | Shell marl, sandy, unconsolidated, tan; fairly fossiliferous, mollusks common, well preserved with <i>Anomalocardia caloosana</i> , and <i>Parastarte triquetra</i> most abundant | 0.2 |
|---|---|-----|

Unconformity

Miocene

- 1 Sand, argillaceous, quartz, coarse, phosphatic (2 percent), generally unconsolidated, but contains small (1- to 5-inch) pockets of matrix cemented firmly with CaCO_3 , tan to light gray (N8). Contains *Balanus concavus*, and great masses of *Encope tamiamiensis* fragments 3.1

Station D-3. NE¼NE¼ sec. 28, T. 41 S., R. 23 E., Punta Gorda quadrangle, Charlotte County, Florida. Section is located on right bank of Alligator Creek approximately 400 yards downstream from station D-2.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
3	Sand, quartz, medium, unconsolidated, tan in lower portion, white above; no fossils observed.....	5.5
Unconformity		
Caloosahatchee Marl		
2	Shell marl, sandy, quartz, medium, slightly consolidated, tan; very fossiliferous, mollusks, abundant, including <i>Miltha caloosaensis</i> , <i>Chama gardnerae</i> and <i>Caryocorbula leonensis</i>	2.0
Unconformity		
Miocene		
Tamiami Formation		
1	Marl, argillaceous, calcareous, phosphatic, slightly consolidated, cream to tan, grades to clay upstream; contains <i>Ostrea</i> sp. and <i>Encope tamiamiensis</i>	1.5

Station D-4. NW¼NE¼ sec. 28, T. 41 S., R. 23 E., Punta Gorda quadrangle, Punta Gorda, Florida. Section located on left bank of Alligator Creek approximately 150 yards downstream from station D-3.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
5	Sand, quartz, medium, subrounded, unconsolidated, gray to tan; fossils abundant, well preserved.....	8.0
4	Clay, blue, sticky; no fossils observed.....	0.4
Unconformity		
Caloosahatchee Marl		
3	Shell marl, sandy, quartz, medium to coarse, subrounded, unconsolidated, moderately sorted, pale yellowish brown (10 yr 6/2); fossils abundant, well preserved, mollusks predominant, characterized by <i>Chione cancellata</i> , <i>Anomalocardia caloosana</i> , <i>Parastarte triquetra</i> , and <i>Juliacorbula scutata</i>	1.0
2	Clay, sandy, phosphatic, unconsolidated, gray to white; mollusks abundant and well preserved.....	1.1
Unconformity		
Miocene		
Tamiami Formation		
1	Limestone, arborescent, concretionary, sandy, hard, sand grains mostly medium, subrounded quartz, with small amount rounded,	

polished phosphate very pale orange (10 yr 8/2); fossil fragments abundant..... 1.5

Station D-5. NW¼NE¼ sec. 28, T. 41 S., R. 23 E., Punta Gorda quadrangle, Charlotte County, Florida. Section on right bank of Alligator Creek approximately 150 yards downstream from station D-4.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
6	Sand, quartz, medium, unconsolidated, lower 3.0 feet red-brown, gray above.....	4.0
Unconformity		
Caloosahatchee Marl		
5	Shell marl, sandy, quartz, medium unconsolidated, tan, mostly in solution holes in unit 4 below; mollusks present.....	0.1
Unconformity		
Miocene		
Tamiami Formation		
4	Limestone, marly, sandy, solution riddled, gray, mottled red-orange; <i>Encope tamiamiensis</i> abundant, <i>Balanus concavus</i> present	0.9
3	Limestone, sandy, soft, gray; contains numerous oysters.....	0.3
2	Clay, calcareous, sandy, hard, especially near the top, white; no fossils observed.....	3.5
1	Limestone arborescent, concretionary (as Unit 1, station D-4)	1.0

Station D-6. NW¼NW¼NE¼ sec. 28, T. 41 S., R. 23 E., Punta Gorda quadrangle, Charlotte County, Florida. Section on right bank of Alligator Creek approximately 200 yards downstream from station D-5 and 20 yards upstream from power lines which cross the creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
3	Sand, quartz, medium, subrounded, unconsolidated, yellow-brown in lower 3.4 feet, gray above.....	4.5
2	Clay, sticky, blue, mottled brownish orange; no fossils observed...	0.8
Unconformity		
Caloosahatchee Marl		
1	Shell marl, sandy, quartz, fine to coarse, subrounded, unconsolidated, pale yellowish brown (10 yr 6/2); very fossiliferous, mollusks abundant and well preserved.....	2.7

Station D-7. NW¼SE¼NE¼ sec. 29, T. 41 S., R. 23 E., Punta Gorda quadrangle, Charlotte County, Florida. Section on left bank of Alligator Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
3	Sand, quartz medium, subrounded, fairly well sorted, unconsolidated, tan to gray; no fossils observed.....	2.0

- | | | |
|---|---|-----|
| 2 | Limestone, sandy, hard, dense, hummocky on surface, very light gray (N8); no fossils observed..... | 1.0 |
| 1 | Marl, calcareous, sandy, compact, very light gray; fossils common, especially <i>Mercenaria campechiensis</i> , <i>Anadara transversa</i> , <i>Chione cancellata</i> , and <i>Chlamys irradians</i> | 1.5 |

Station D-8. SE¼NW¼NE¼ sec. 26, T. 41 S., R. 23 E., Cleveland quadrangle, Charlotte County, Florida. Section in drainage ditch approximately 20 feet east of the South Fork of Alligator Creek.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
3	Sand, quartz, medium, subrounded, unconsolidated, brown in lower 4 feet, gray above; no fossils observed.....	5.5
Unconformity		
Caloosahatchee Marl		
2	Marl, calcareous, sandy, unconsolidated, gray to cream; very fossiliferous, mollusks abundant, well preserved.....	3.0
Unconformity		
Miocene		
Tamiami Formation		
1	Sand, marly, argillaceous, phosphatic, gray; fossils common including <i>Balanus concavus</i> , <i>Encope tamiamiensis</i> , and <i>Ostrea tamiamiensis</i>	?

Station D-20. NE¼NW¼ sec. 21, T. 41 S., R. 23 E., Punta Gorda quadrangle, Charlotte County, Florida. Section measured in shell pit approximately 50 yards southwest of Taylor Street extension.

Bed	Description	Thickness (feet)
Pleistocene		
Fort Thompson Formation		
5	Sand, quartz, medium, subangular to subrounded, clear, well sorted, unconsolidated, white; no fossils observed.....	2.5
4	Sand, quartz, medium, subrounded, slightly frosted, rare grains of black phosphate, well sorted, slightly consolidated, moderate yellowish brown (10 yr 5/4); no fossils observed.....	3.4
3	Shell marl marine, sandy, quartz, medium, subrounded, slightly frosted, well sorted, slightly consolidated, very pale orange (10 yr 8/2); very fossiliferous, well preserved, white, mollusks abundant	4.8
2	Sand, marine, quartz, medium, subangular, clear, largest grains subrounded and frosted, well sorted, slightly consolidated, moderate yellowish brown (10 yr 5/4) stained dark yellowish brown (10 yr 4/2); grades laterally to a soft plastic brown clay; fossils rare, mostly mollusks, white, well preserved.....	0.5
1	Shell marl, sandy, quartz (99 percent), medium, subrounded, clear, medium black phosphate (1 percent), well sorted, slightly consolidated, very pale orange (10 yr 8/2); very fossiliferous, well preserved, white mollusks abundant, forams rare, colonial corals common in lower part.....	4.0

Station D-21. NW¼ sec. 32, T. 41 S., R. 23 E., Punta Gorda SE quadrangle, Charlotte County, Florida.

Collections were made from spoil piles along a new pit. The matrix is a phosphatic unconsolidated quartz sand containing abundant specimens of *Encope tamiamiensis*, *Balanus concavus*, and *Ostrea disparilis*. This is the Tamiami Formation.

Station D-22. SW¼SW¼ sec. 33, T. 41 S., R. 23 E., Punta Gorda SE quadrangle, Charlotte County, Florida. Exposure in east-west pit on new gravel road just east of State Highway 765.

Collections made from spoil piles. Matrix is a yellowish brown arenaceous clay containing numerous small (2.0-3.0 inches) chert nodules. The fauna is comprised predominantly of specimens of *Ostrea tamiamiensis*, *Ostrea disparilis*, *Anadara* sp., and *Balanus* sp. This is the Tamiami Formation.

Station D-23. NE¼NE¼NE¼ sec. 8, on section corners 8, 4, and 9, T. 42 S., R. 23 E., Punta Gorda SE quadrangle, Charlotte County, Florida. Exposure in drainage canal on west side of road.

Collections were made from the bottom of a drainage canal. The matrix is a mixture of unconsolidated tan quartz sand and shells overlain by about 4 feet of unfossiliferous tan quartz sand. The fauna collected included *Mercenaria campechiensis* and *Chione cancellata*. Apparently this bed represents the Fort Thompson Formation.

Station D-24. NE¼NE¼ sec. 30, T. 42 S., R. 23 E., Punta Gorda SE quadrangle, Charlotte County, Florida. Exposure in borrow pit 0.2 mile west of State Highway 765.

Collections were made from rather old spoil piles arranged along the edges of a borrow pit. Valves of the Tamiami oyster *Ostrea disparilis* were found scattered over the surface of the piles. In addition, large blocks of a dense, gray limestone were scattered around the area. These limestone blocks contained valves of *Miltha caloosaensis*, *Pecten raveneli* and *Chlamys fuscopurpureus*, colonies of *Vermicularia* and numerous bone fragments and teeth of the Pleistocene horse *Equus* (*Equus*) *leidyi*.

Apparently at this locality the Tamiami Formation is overlain by the Caloosahatchee Marl here represented by a limestone.

Station D-25. NW¼SE¼ sec. 19, T. 42 S., R. 23 E., Punta Gorda SE quadrangle, Charlotte County, Florida. Exposures in marinas at Pirate's Cove approximately 0.6 mile west of State Highway 765.

Collections were made from spoil piles. The matrix consists of a tan, sandy, calcareous clay containing numerous specimens of *Ostrea disparilis* and *Ostrea tamiamiensis*.

MEGAFOSSIL CHECK LIST, CHARLOTTE HARBOR AREA, FLORIDA

(T, Tamiami Formation; B through F, units of the Caloosahatchee Marl on Shell Creek; X, identified from Locklin Shell Creek collection; L, reported from literature; A1, Caloosahatchee Marl on Alligator Creek; A2, Fort Thompson Formation; M, Frank Burns collection U.S. National Museum.)

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Pelecypoda											
<i>Abra aequalis</i> (Say)				X		X		X			X
<i>Aligena aequalis</i> Conrad											X
<i>Amusium mortoni</i> (Ravenel)				X	X		X	X	X		
<i>Anadara</i> cf. <i>A. campyla</i> (Dall)				X			X	X	X		
<i>Anadara catasarca</i> (Dall)							X				X
<i>Anadara improcera</i> (Conrad)				X			X	X	X		X
<i>Anadara</i> cf. <i>A. improcera</i> (Conrad)				X				X			
<i>Anadara lienosa</i> (Say)				X		X	X	X	X	X	X
<i>Anadara megerata</i> Olsson and Harbison						X	X	X			
<i>Anadara milifila</i> (Dall)							X				
<i>Anadara plicatura</i> (Conrad)							X				
<i>Anadara reticulata</i> (Gmelin)							X				
<i>Anadara rustica</i> (Tuomey and Holmes)		X		X			X	X	X		X
<i>Anadara scalarina</i> (Heilprin)							X		X		X
<i>Anadara</i> sp. a						X			X		
<i>Anadara</i> sp. b									X		
<i>Anadara</i> sp. c						X					
<i>Anadara transversa</i> (Say)				X		X				X	
<i>Anadontia alba</i> Link				X	X	X					X
<i>Anadontia</i> sp.									X		
<i>Anisodonta americana</i> Dall							X	X			X
<i>Anomalocardia caloosana</i> (Dall)				X	X	X	X	X	X		X
<i>Anomalocardia</i> sp. a								X			
<i>Anomia simplex</i> d'Orbigny	X	X		X	X	X		X	X		X
<i>Antigona rugatina</i> (Heilprin)							X	X			
<i>Arca aquila</i> Heilprin											X
<i>Arca caloosahatchiensis</i> Sheldon							X				
<i>Arca wagneriana</i> Dall			X	X	X		X	X	X		X
? <i>Astarte undulata deltoidea</i> Gardner							X				
<i>Atrina caloosensis</i> (Dall)				X	X						X
<i>Barbatia irregularis</i> Dall							X	X	X		X
<i>Barbatia taeniata</i> (Dall)				X				X			X

Species	Distribution											
	T	B	C	D	E	F	L	X	A1	A2	M	
Pelecypoda (Continued)												
<i>Bornia</i> cf. <i>B. Bladenensis</i> Gardner								X				
<i>Bornia tioica</i> Dall								X			X	
<i>Bornia lota</i> Dall											X	
<i>Bornia triangular</i> Dall							X				X	
<i>Bothrocorbula willcoxi</i> (Dall)				X				X	X		X	
<i>Brachiodontes crustus</i> (Linné)				X		X			X		X	
<i>Brachiodontes venustus</i> Olsson and Harbison								X				
<i>Cardita arata</i> (Conrad)				X		X	X	X	X	X	X	
<i>Cardita catharia</i> Dall?								X				
<i>Cardita floridana</i> Conrad				X		X	X	X	X			
<i>Cardita perplana</i> (Conrad)				X			X				X	
<i>Cardita perplana abbreviata</i> Conrad							X	X				
<i>Cardita tridentata</i> (Say)				X		X		X	X		X	
<i>Cardita</i> sp.				X								
<i>Caryocorbula barrattiana</i> C. B. Adams						?						
<i>Caryocorbula leonensis</i> Mansfield		X		X		X	X	X	X		X	
<i>Chama caloosana</i> Dall						X	X	X	X		X	
<i>Chama gardnerae</i> Olsson and Harbison			X	X	X	X	X	X	X		X	
<i>Chama heilprini</i> Cossmann											X	
<i>Chama</i> sp.								X				
<i>Chama willcoxi</i> Dall						X		X	X		X	
<i>Chione cancellata</i> (Linné)		X	X	X	X	X	X	X	X	X	X	
<i>Chione grus</i> (Holmes)		X		X		X	X	X	X		X	
<i>Chione latilirata athleta</i> (Conrad)						X	X	X	X		X	
<i>Chione morsitans</i> Olsson and Harbison						X		X				
<i>Chione</i> n. sp. a ?							X					
<i>Chione</i> sp. a							X					
<i>Chlamys anteampliocostatus</i> (Mansfield)				X		X	X	X	X		X	
<i>Chlamys buckinghamensis</i> Mansfield	X											
<i>Chlamys caloosaensis</i> (Dall)						X	X				X	
<i>Chlamys</i> cf. <i>C. comparilis</i> (Tuomey and Holmes)				X								
<i>Chlamys fuscopurpureus</i> (Conrad)				X		X	X	X		X		
<i>Chlamys irradians</i> (Lamarek)							X			X	X	
<i>Chlamys irremotis</i> Olsson and Harbison								X				
<i>Chlamys nodosus</i> (Linné)						?	X	X				
<i>Chlamys solarioides</i> (Heilprin)				X		X	X	X			X	
<i>Chlamys</i> spp.				X	X	X			X			
<i>Codakia costata</i> d'Orbigny				X		X						

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Pelecypoda (Continued)											
<i>Codakia orbicularis</i> Linné						X	X	X	X		X
<i>Codakia speciosa</i> Rogers							X	X			X
<i>Codakia</i> sp.								X			
<i>Cooperella carpenteri</i> Dall											X
<i>Coralliophaga coralliophaga</i> Gmelin							X				
<i>Crassinella acuta</i> (Dall)		X		X		X	X	X			X
<i>Crassinella dupliniana</i> (Dall)						X		X			
<i>Crassinella lunulata</i> (Conrad)				X		X	X	X			X
<i>Crassostrea virginica</i> (Gmelin)		X				X			X		
<i>Crenella divaricata</i> (d'Orbigny)						X	X	X			X
<i>Cumingia amydra</i> Olsson and Harbison				X		X	X				
<i>Cumingia coarctata</i> Sowerby								X			X
<i>Cuspidaria mansfieldi</i> Olsson and Harbison								X			
<i>Cuspidaria ornatissima</i> d'Orbigny							X				
<i>Cyathodonta semirugosa</i> Reeves											X
<i>Cyclinella tenuis</i> Recluz											X
<i>Dinocardium robustum</i> (Solander)				X		X			X		X
<i>Diplodonta capuloides</i> Gabb											X
<i>Diplodonta acclinus</i> Conrad				X		X					
<i>Diplodonta semiaspera</i> Philippi											X
<i>Diplodonta soror</i> C. B. Adams											X
<i>Divaricella compsa</i> Dall				X	X		X	X	X		X
<i>Divaricella</i> sp.						X					
<i>Donax fossor</i> Say								X			
<i>Dosinia discus</i> Reeve					X		X				
<i>Dosinia elegans</i> Conrad		X		X		X	X		X		X
<i>Echinochama cornuta</i> (Conrad)				X	X	X	X	X	X		X
<i>Ensitellops elongata</i> Olsson and Harbison								X			
<i>Ensitellops</i> sp. a				X							
<i>Ensitellops</i> sp.								X			
<i>Ervilia polita</i> Dall				X						X	X
? <i>Ervilia</i> sp.							X				
<i>Erycina carolinensis</i> Dall											X
<i>Erycina kurtzi</i> Dall											X
<i>Erycina phaseola</i> Olsson and Harbison								X			
<i>Erycina protracta</i> Dall											X
<i>Eucrassatella speciosa</i> (A. Adams)				X		X		X	X		X
<i>Fabella dalli</i> Olsson and Harbison								X			

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Pelecypoda (Continued)											
<i>Fossularca adamsi</i> (Dall)		X	X	X	X	X		X	X		X
<i>Gemma magna floridana</i> Olsson and Harbison							X	X			
<i>Glycymeris americana</i> DeFrance						X					
<i>Glycymeris arata floridana</i> Olsson and Harbison					X	X	X	X	X		X
<i>Glycymeris pectinata</i> (Gmelin)							X	X			
<i>Gouldia</i> cf. <i>G. cerina</i> C. B. Adams				X	X						
<i>Gouldia floridana</i> Olsson and Harbison				?				X			
<i>Gouldia metastriatum</i> Conrad		?		?			X				X
<i>Gouldia</i> sp.				X							
<i>Hiatella arctica</i> (Linné)								X			
? <i>Hindsella</i> sp.								X			
<i>Hyalina aenacea</i> Deshayes								X			
<i>Isognomon alata bicolor</i> (C. B. Adams)				X				X			X
<i>Juliacorbula scutata</i> (Gardner)						X		X			X
<i>Labiosa lineata</i> Say											X
<i>Labiosa plicatella</i> (Lamarek)								X			
<i>Laevicardium laevigatum wagnerianum</i> Olsson and Harbison				X				X		X	X
<i>Laevicardium mortoni</i> Conrad				X		X	X		X		X
<i>Lima caloosana</i> Dall											X
<i>Lima scabra</i> (Born)						X	X				
<i>Lima</i> sp.								X			
<i>Lithophaga</i> sp. ?								X			
<i>Lucina pennsylvanica</i> Linné						X	X	X	X		X
<i>Macoma</i> sp. a						X					
<i>Macoma tenta</i> Say											X
<i>Macrocallista maculata</i> (Linné)				X		X		X			X
<i>Macrocallista nimbose</i> (Solander)				X		X		X			X
<i>Mactra fragilis</i> Gmelin								X			X
<i>Mercenaria campechiensis</i> (Gmelin)	X			X		X	X	X	X		X
<i>Mercenaria rileyi</i> Conrad											X
<i>Mercenaria tridacnoides</i> (Lamarek)							X	X			
<i>Miltha caloosaensis</i> (Dall)				X	X			X	X		X
? <i>Modiolus</i> cf. <i>M. americanus</i> Leach						X					
<i>Modiolus ducatei</i> Conrad											X
<i>Montacuta floridana</i> Dall											X
<i>Montacuta petropolitana</i> Dall											X
<i>Mulinia caloosaensis</i> Dall							X	X			

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Pelecypoda (Continued)											
<i>Mulinia lateralis</i> Say		X	X	X		X			X	X	X
<i>Mulinia sapotilla</i> Dall				X			X	X	X		X
<i>Mulinia undula</i> Dall							X				X
<i>Musculus lateralis</i> Say ?								X			
<i>Mysella planulata</i> Stimpson											X
<i>Mytilopsis lamellata</i> Dall							X				
<i>Noetia limula</i> Conrad							X				X
<i>Noetia platyura</i> Dall				X	X			X	X		X
<i>Noetia ponderosa</i> (Say)										X	
<i>Nucula proxima</i> Say		X		X		X	X	X	X	X	X
<i>Nuculana acuta</i> (Conrad)		X		X		X	X	X	X		X
<i>Nuculana</i> sp. smooth form								X			
<i>Ostrea disparilis</i> Conrad	X										
<i>Ostrea meridionalis</i> Heilprin	X										
<i>Ostrea sculpturata</i> Conrad		X		X		X		X	X		X
<i>Ostrea</i> sp.									X		
<i>Pandora arenosa</i> Conrad							X				
<i>Pandora</i> cf. <i>P. crassidens</i> Conrad						X					
<i>Pandora</i> sp. a new?								X			
<i>Panope floridana</i> Heilprin							X	X	X		X
<i>Papyridea semisculcata</i> Gray											X
<i>Papyridea spinosum spinosum</i> Meuschen								X			
<i>Papyridea spinosum turtoni</i> Dall ?								X			X
<i>Papyridea sulcata</i> Gray								X			
<i>Parastarte triquetra</i> (Conrad)				X	X	X	X	X	X		X
<i>Pecten ziczac</i> Linné				X							
<i>Phacoides amabilis</i> (Dall)							X	X			X
<i>Phacoides anadonta</i> (Say)				X		X	X		X		X
<i>Phacoides disciformis</i> (Heilprin)							X				X
<i>Phacoides multilineatus</i> (Tuomey and Holmes)				X	X	X	X	X	X	X	X
<i>Phacoides multilineatus</i> subsp. a						X					
<i>Phacoides nassula caloosana</i> Dall				X		X	X		X	X	X
<i>Phacoides pectinatus</i> (Gmelin)							X				
<i>Phacoides radians</i> Conrad				X		X	X	X	X		X
<i>Phacoides trisulcatus</i> (Dall)							X	X			X
<i>Phacoides waccamawensis</i> Dall		X		X	X	X	X	X	X		X
<i>Pitar opisthogrammata</i> (Dall)							X	X			X
<i>Pitar</i> cf. <i>P. sayana</i> (Conrad)				X	X	X			X		

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Pelecypoda (Continued)											
<i>Pleurodesma floridana</i> Dall							X				
<i>Plicatula marginata</i> Say				X		X	X	X	X	X	X
<i>Plicatula</i> sp. a new ?						X					
<i>Pseudocyrena dupliniana</i> (Dall)							X				
<i>Pseudocyrena floridana</i> (Conrad)											X
<i>Pteria colymbus</i> (Bolton)				X			X	X			X
<i>Rangia cuneata</i> Gray							X				
<i>Rangia nasuta</i> (Dall)		X		X					X		
<i>Roccellaria hians</i> (Spengler)				X			X	X			X
<i>Rupellaria typica</i> (Jonas)											X
<i>Saxicava arctica</i> Linné											X
<i>Semele bellastrata</i> Conrad				X		X	X	X			
<i>Semele leana</i> Dall							X				
<i>Semele perlamellosa</i> Heilprin						X	X				X
<i>Semele purpurascens</i> Gmelin											X
<i>Solecurtus cumingiana</i> (Dunker)				X		X	X	X			X
<i>Sphenia</i> cf. <i>S. attenuata</i> Dall								X			
<i>Spondylus rotundatus</i> Heilprin				X		X	X				X
<i>Sportella constricta</i> (Conrad)							X				X
<i>Sportella protexta</i> Conrad											X
<i>Strigilla flexuosa</i> (Say)							X	X			
<i>Tagelus divisis</i> (Spengler)				X			X	X	X		X
<i>Taxocardia floridana</i> Olsson and Harbison							X	X			
<i>Tellidora lunulata</i> Holmes				X		X	X	X	X		
<i>Tellidora cristata</i> Recluz							X				X
<i>Tellina</i> cf. <i>T. agilis</i> Stimpson				X		X					
<i>Tellina aequistriata</i> Say											X
<i>Tellina alternata</i> Say				X			X	X			X
<i>Tellina calligypta</i> Dall				X			X	X			X
<i>Tellina caloosana</i> Dall								X			X
<i>Tellina declivis</i> Conrad							X				
<i>Tellina dinomera</i> Dall											X
<i>Tellina mexicana</i> Petit							X	X			
<i>Tellina sayi</i> (Deshayes)											X
<i>Tellina similis</i> Sowerby				X							
<i>Tellina strictolineata</i> Olsson and Harbison								X			
<i>Tellina suberis</i> Dall				X				X			X
<i>Tellina</i> sp. a				X							

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Pelecypoda (Continued)											
<i>Tellina</i> sp. b				X							
<i>Tellina</i> sp. c				X					X		
<i>Tellina</i> sp. d									X		
<i>Tellina</i> sp. f				X							
<i>Tellina</i> spp.		X		X		X		X			
<i>Tellina tampaensis</i> Conrad											X
<i>Tellina tayloriana</i> Sowerby		X				X		X	X		
<i>Thyasira trisinuata</i> d'Orbigny							X				
<i>Trachycardium dalli</i> (Heilprin)							X				
<i>Trachycardium egmontianum</i> (Shuttleworth)							X				
<i>Trachycardium emmonsi</i> (Dall)				X		X		X			X
<i>Trachycardium isocardia</i> (Conrad)								X			X
<i>Trachycardium</i> cf. <i>T. muricatum</i> (Linné)				X		X					
<i>Trachycardium oedatum</i> (Dall)							X	X			X
<i>Trachycardium</i> sp.			X	X		X			X		
<i>Transennella caloosana</i> Dall							X				X
<i>Transennella conradina</i> (Dall)				X	X	X		X	X		
<i>Transennella</i> sp. a new ?								X			
<i>Trigoniocardia columba</i> (Heilprin)						X	X	X			X
<i>Trigoniocardia willcoxi</i> (Dall)		X		X		X	X	X		X	X
<i>Varicorbula caloosae</i> (Dall)		X	X	X	X	X	X	X	X		X
<i>Verticordia emmonsi</i> Dall								X			
Gastropoda											
<i>Acmea punctulata</i> Gmelin											X
<i>Acmaea</i> sp. a new ?							X				
<i>Acteon punctostriatus</i> (C. B. Adams)				X				X			X
<i>Adeorbis concava</i> H. C. Lea											X
<i>Adeorbis ezacua</i> Conrad											X
<i>Adeorbis supranitidus</i> Wood											X
<i>Aerotrema</i> sp.								X			
<i>Aesopus</i> cf. <i>A. stearnsi</i> Tyron								X			
<i>Alabina adamsi</i> (Dall)		X		X		X	X	X			X
<i>Alabina cerithioides</i> (Dall)		X		X			X	X			X
<i>Alabina</i> sp. a				X							
? <i>Alvania</i> sp.							X				
<i>Amnicola floridana convexa</i> Pilsbry							X				X
<i>Amnicola lerodes</i> Pilsbry							X	X			

Species	Distribution											
	T	B	C	D	E	F	L	X	A1	A2	M	
Gastropoda (Continued)												
<i>Amnicola omphalotropis</i> Pilsbry											X	
<i>Ampullaria hopetonensis</i> Lea							X					
<i>Anachis avara amydra</i> Dall							X				X	
<i>Anachis caloosaensis</i> (Dall)				X		X	X	X			X	
<i>Anachis camax</i> Dall								X	X		X	
<i>Anachis</i> cf. <i>A. camax</i> Dall							X	X				
<i>Anachis clewistonensis</i> M. Smith ?							X					
<i>Anachis fenestrata</i> (C. B. Adams)								X				
<i>Anachis gardnerae</i> Olsson and Harbison				X		X		X		X		
<i>Anachis gardnerae escarinata</i> Olsson and Harbison				X		X		X				
<i>Anachis</i> sp.						X						
<i>Anticlimax annae</i> Pilsbry and Olsson								X				
<i>Anticlimax calliglypta</i> (Dall)							X	X				
<i>Anticlimax locklini</i> Pilsbry and Olsson							X					
<i>Anticlimax</i> sp. a new ?								X				
<i>Arene gemma</i> (Tuomey and Holmes)							X				X	
<i>Arene</i> sp. a								X				
<i>Arene</i> sp. b								X				
<i>Arene tricarinata</i> (Stearns)								X				
<i>Aspella engonata</i> (Dall)				X			X	X			X	
<i>Aspella senex</i> Dall							X	X			X	
<i>Assimineea affinis</i> d'Orbigny							X				X	
<i>Assimineea auberiana</i> d'Orbigny							X				X	
<i>Astraea longispina</i> (Lamarck)								X				
<i>Astrea precursor</i> Dall							X	X			X	
<i>Astyris lunata</i> Say											X	
<i>Astyris fusiformis</i> d'Orbigny							X				X	
<i>Astyris multilineata</i> Dall											X	
<i>Astyris profundus</i> Dall							X				X	
<i>Astyris profundus minor</i> Dall							X				X	
<i>Astyris profundus permagna</i> Dall											X	
<i>Atys obscuratus</i> Dall						X	X					
<i>Atys sandersoni</i> Dall						X	X				X	
<i>Atys subscuratus</i> subsp. a				X								
<i>Ayrgocythara</i> sp. a new ?								X				
<i>Bailya intricatus</i> (Dall)								X				
<i>Bailya roycei</i> (Smith)								X				

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
<i>Bartschella</i> cf. <i>B. parkeri</i> Bartsch				X							
<i>Bittium podagrinum</i> Dall				X			X	X			X
<i>Bittium</i> sp. a				X							
<i>Bittium varium</i> Pfeiffer				X		X	X		X		X
" <i>Bittium</i> " sp.				X		X					
<i>Brachyocythara</i> sp. a new ?				X				X			
<i>Brachyocythara terminula</i> (Dall)		X									X
<i>Bulla occidentalis</i> Adams				X		X			X		
<i>Bulla</i> cf. <i>B. occidentalis</i> Adams									X		
? <i>Bulla</i> sp. juvenile ?								X			
<i>Bulla striata</i> Brugière				X				X		X	X
<i>Bulla striata attenuata</i> Dall											X
<i>Busycon contrarium</i> (Conrad)				X	X	X		X	X		X
<i>Busycon echinatum</i> (Dall)								X			X
<i>Busycon maximum</i> Conrad											X
<i>Busycon planulatum</i> (Dall)							X	X			X
<i>Busycon pyrum</i> (Dillwyn)						X	X	X			X
<i>Busycon pyrum floridanum</i> Olsson and Harbison				X		X		X			
<i>Busycon rapum</i> (Heilprin)				X				X	X		
<i>Busycon</i> sp.				X						X	
<i>Bythinella nickliniana attenuata</i> Haldeman							X				X
<i>Caecum</i> cf. <i>C. cinctum</i> Olsson and Harbison						X	X				
<i>Caecum cooperi</i> S. Smith							X				X
<i>Caecum cornellum</i> Dall				X		X	X				X
<i>Caecum</i> cf. <i>C. flemingi</i> Gardner and Aldrich								X			
<i>Caecum floridanum</i> Stimpson				X		X		X	X		
<i>Caecum floridanum</i> subsp. ?				X		X		X			
<i>Caecum imbricatum</i> Carpenter				X		X		X	X		
<i>Caecum imbricatum</i> subsp. b new ?						X		X			
<i>Caecum imbricatum</i> subsp. ?						X		X			
<i>Caecum</i> n. sp. a ? nude form								X			
<i>Caecum</i> n. sp. b ?								X			
<i>Caecum regulare</i> Carpenter				X		X	X	X			X
<i>Caecum</i> sp.						X					
<i>Caecum tortile</i> Dall ?						X					
<i>Calliostoma euconulum</i> Olsson and Harbison								X			
<i>Calliostoma jujubinum</i> Gmelin					X						X
<i>Calliostoma prejujubinum</i> Olsson and Harbison							X	X			

Species	Distribution											
	T	B	C	D	E	F	L	X	A1	A2	M	
Gastropoda (Continued)												
<i>Calliostoma roseolum permagnum</i> Dall				X							X	
<i>Calliostoma seminolum</i> Olsson and Harbison						X	X	X				
<i>Calliostoma</i> n. sp. a ?								X				
<i>Calliostoma</i> sp. b								X				
<i>Calliostoma</i> spp.				X		X		X				
<i>Calliostoma willcozianum</i> Dall				X			X	X			X	
<i>Calodisculus retiferus</i> (Dall)							X	X			X	
<i>Calyptrea centralis</i> (Conrad)				?				X			X	
? <i>Campsodrillia</i> sp. a				X								
<i>Cancellaria conradiana</i> Dall				X		X	X	X	X		X	
<i>Cancellaria venusta</i> Tuomey and Holmes								X			X	
<i>Cantharus floridana</i> (Conrad)							X				X	
<i>Cantharus floridana attenuata</i> (Dall)								X				
<i>Cantharus multangulata</i> (Philippi)							X	X			X	
<i>Cantharus</i> n. sp. a								X				
<i>Cantharus perplexus</i> Olsson and Harbison				X	X	X		X	X			
? <i>Cantharus</i> sp. a								X				
<i>Cantharus</i> sp. b								X				
? <i>Cantharus</i> sp.									X			
<i>Cerithidea pliculosa</i> (Menke)								X				
<i>Cerithidea turrita</i> Stearns											X	
<i>Cerithiopsis brassica</i> Olsson and Harbison								X				
<i>Cerithiopsis dauca</i> Olsson and Harbison								X				
<i>Cerithiopsis emersoni persubulata</i> Gardner				X				X			X	
<i>Cerithiopsis floridana</i> Dall											X	
<i>Cerithiopsis greeni</i> C. B. Adams											X	
<i>Cerithiopsis modesta</i> Adams											X	
<i>Cerithiopsis scaliphus</i> Dall											X	
<i>Cerithiopsis</i> sp. a								X				
<i>Cerithiopsis</i> sp. d								X				
<i>Cerithium algicola</i> C. B. Adams		?									X	
<i>Cerithium callisoma</i> Dall								X				
<i>Cerithium caloosae</i> Dall				X			X	X	X		X	
<i>Cerithium caloosae</i> nsis <i>heilprini</i> Dall											X	
<i>Cerithium coccodes</i> Dall							X				X	
<i>Cerithium floridanum</i> Mörch								X			X	
<i>Cerithium glaphrea</i> Dall											X	
<i>Cerithium litharium</i> Dall				X		X	X	X	X			

Species	Distribution											
	T	B	C	D	E	F	L	X	A1	A2	M	
Gastropoda (Continued)												
<i>Cerithium muscarum</i> Say							X				X	
<i>Cerithium</i> spp.								X	X			
<i>Cerithium</i> cf. <i>C. preatratum</i> Olsson and Harbison								X				
<i>Cerithium</i> sp.				X		X						
<i>Cerithium</i> sp. a						X						
<i>Cerithium triticium</i> Olsson and Harbison								X				
<i>Cerithium vicinia</i> Olsson and Harbison						X		X				
<i>Cerodrillia perpolita</i> (Dall)								X			X	
<i>Cerodrillia simpsoni</i> (Dall)								X			X	
<i>Cerodrillia simpsoni recticostata</i> Fargo								X				
? <i>Cerodrillia</i> sp.								X				
<i>Cheilea equestris</i> Linné								X				
? <i>Cheilea</i> sp.							X	X				
<i>Chrysallida</i> cf. <i>C. locklini</i> Bartsch						X						
<i>Chrysallida macneili</i> Bartsch										X		
<i>Clathrodrillia acurugata</i> (Dall)											X	
<i>Clathrodrillia ebinina</i> (Dall)				X				X			X	
<i>Clathrodrillia ostrearum</i> (Stearns)				X		X	X		X			
<i>Clathrodrillia ostrearum abundans</i> (Dall)											X	
<i>Clathrus antillarum</i> (deBoury)								X				
<i>Clathrus rupicolum</i> (Kurtz)								X				
<i>Clathrus</i> sp.								X	X			
<i>Cochliolepsis holmesi</i> Dall								X				
<i>Cochliolepsis</i> sp. a								X				
? <i>Cochliolepsis</i> sp.								X				
<i>Cochliolepsis striata</i> Dall								X			X	
<i>Colubraria lanceolata</i> Menke							X	X			X	
<i>Colubraria lanceolata acclinica</i> Tucker and Wilson				X				X				
<i>Columbella cosmia</i> Dall							X				X	
<i>Columbella rusticoides</i> Heilprin								X				
<i>Compsodrillia</i> cf. <i>C. aphanitoma</i> (Dall)								X				
<i>Compsodrillia drewi pinellas</i> Fargo							X					
<i>Compsodrillia pylonia</i> Fargo								X				
<i>Conus adversarius</i> Conrad				X			X				X	
<i>Conus daucus</i> Linné				?			X	X			X	
<i>Conus floridanus</i> Gabb				X			X	X		X	X	
<i>Conus pealii</i> Green							X				X	
<i>Conus pygmaeus</i> Reeve							X				X	

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
<i>Conus stearnsi</i> Conrad				X	X	X		X	X		
<i>Crassispira perrugata</i> (Dall)				X							
<i>Crepidula aculeata</i> Gmelin			X	X	X	X	X	X	X		X
<i>Crepidula aesop</i> Dall							X	X			X
<i>Crepidula convexa</i> Say											X
<i>Crepidula fornicata</i> Say							X				X
<i>Crepidula maculosa</i> Conrad		X		X		X		X	X	X	
<i>Crepidula plana</i> Say				X		X		X			X
<i>Crepidula rhyssema</i> Olsson and Harbison								X			
<i>Crucibulum auriculum</i> Gmelin		X	X	X	X	X		X	X		X
<i>Crucibulum costatum</i> Say				X			X				X
<i>Crucibulum imbricatum</i> (Sowerby)								X			
<i>Crucibulum spinosum</i> Sowerby								X			X
<i>Crucibulum</i> sp.				X				X			
<i>Cryoturris</i> cf. <i>C. sarta</i> Fargo								X			
<i>Cyclotremiscus bartschi</i> (Mansfield)							X	X			
<i>Cyclotremiscus beaujeu bicarinata</i> (Guppy)								X			
<i>Cyclotremiscus fargo</i> Olsson and Harbison								X			
<i>Cyclotremiscus gunteri</i> (Mansfield)							X	X			
<i>Cyclotremiscus olssoni</i> Olsson and Harbison							X	X			
<i>Cylichnella</i> sp. a new ?				X				X			
<i>Cylichnella bidentata</i> d'Orbigny											X
<i>Cylichnella</i> cf. <i>C. gabbi</i> (Dall)				X		X					
<i>Cymatosyrinx aepynota acila</i> (Dall)											X
<i>Cymatosyrinx lunata</i> (Lea)				X	X			X	X		X
<i>Cymatosyrinx moseri</i> (Dall)											X
<i>Cymatosyrinx myrmecoon</i> (Dall)											X
<i>Cymatosyrinx pagodula</i> (Dall)											X
<i>Cymatosyrinx perpolita</i> (Dall)				X							
<i>Cypraea problematica</i> Heilprin				X			X	X	X		X
<i>Cypraeolina lachrimula</i> (Gould)								X			
" <i>Cythara</i> " <i>balteata</i> Reeve											X
" <i>Cythara</i> " sp. a				X							
" <i>Cythara</i> " sp. b				X							
<i>Daphnella cingulata</i> Dall							X				X
<i>Daphnella elata</i> Dall						X					X
<i>Daphnella modesta</i> Dall								X			
<i>Daphnella</i> sp. a								X			

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
? <i>Daphnella</i> sp.								X			
<i>Didianema duplinensis comes</i> Olsson and Harbison								X			
<i>Diodora caloosaensis</i> (Dall)							X	X			
<i>Diodora</i> cf. <i>D. caloosaensis</i> (Dall)						X		X			X
<i>Diodora carditella</i> (Dall)							X	X			X
<i>Diodora carditella petasa</i> Olsson and Harbison								X			
<i>Diodora cayenensis</i> (Lamarek)				X		X		X	X		X
<i>Diodora floridana</i> Gardner							X	X			X
<i>Diodora nucula</i> (Dall)								X			X
<i>Diodora</i> sp.			X								
<i>Discohelix</i> sp. a				X							
" <i>Drillia</i> " <i>albomaculata</i> Dall											X
" <i>Drillia</i> " <i>ebur</i> Reeve											X
" <i>Drillia</i> " <i>perspirata</i> Dall											X
" <i>Drillia</i> " sp. a							X				
" <i>Drillia</i> " sp. c									X		
" <i>Drillia</i> " spp.			X								
<i>Emarginula pilsbryi</i> Dall								X			X
<i>Engina floridana</i> Olsson and Harbison							X	X			
<i>Engina turbinella</i> Kiener							X				
<i>Episcynia multicarinata</i> Stimpson							X				X
<i>Epitonium</i> cf. <i>E. foliaceicostum</i> (d'Orbigny)								X			
<i>Epitonium frielei</i> (Dall) ?											X
<i>Epitonium lineato</i> (Say)				X							X
<i>Epitonium turriculum</i> (Sowerby)											X
<i>Erato maugeriae</i> Gray				X		X	X	X	X		X
<i>Euglandina rosea</i> (Ferussac)								X			
<i>Euglandina truncata</i> (Gmelin)											X
<i>Eupleura caudata</i> (Say)						X		X			X
<i>Eupleura miocenica intermedia</i> Dall											X
<i>Eupleura</i> sp. a								X			
<i>Fasciolaria apicina</i> Dall				X	X	X		X	X		X
<i>Fasciolaria distans</i> Linné									X		
<i>Fasciolaria gigantea</i> Kiener							X	X			X
<i>Fasciolaria scalarina</i> Heilprin		X		X			X				X
<i>Fasciolaria tulipa</i> Linné						X					
<i>Picus papyratia</i> (Say)						X		X			X

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
<i>Fontigens palaea</i> Pilsbry							X	X			
<i>Fontigens plana</i> (Aldrich)							X	X			
" <i>Fontigens</i> " spp.				X					X		
<i>Fossarus anomala</i> C. B. Adams								X			X
<i>Fusinus caloosensis</i> Heilprin				X			X	X			X
<i>Fusinus caloosensis florida</i> Olsson and Harbison								X			
? <i>Gastrocopta</i> sp. a								X			
<i>Gelasinostoma elegantula</i> (Dall)				X			X	X			X
<i>Gelasinostoma radiata</i> (Dall)											X
<i>Gibberulina ovuliformis</i> (d'Orbigny)				X		X					
<i>Glyphostoma gratula</i> Dall											X
<i>Glyphostoma gratula incile</i> Watson											X
<i>Glyphostoma polysculptum</i> Fargo				X							
<i>Glyphostoma scopetes</i> Dall				X			X				
<i>Glyphostoma watsoni</i> Dall											X
<i>Gyraulus parvus</i> (Say)								X			
<i>Hanetia mengeana</i> (Dall)							X				X
<i>Helisoma conanti</i> (Dall)				X		X		X	X		X
<i>Helisoma disstoni</i> (Dall)				X			X		X		X
<i>Helisoma scalare</i> (Jay)								X			
<i>Helisoma</i> sp.									X		
<i>Hemitoma retiporosa</i> (Dall)							X	X			X
<i>Hydrobia amnicoloides</i> Pilsbry								X			X
" <i>Hydrobia</i> " spp.				X		X			X		
<i>Ithythythara kellumi</i> Olsson and Harbison				X			X				
<i>Ithythythara psila</i> (Bush)											X
<i>Kurtziella cerina</i> Kurtz and Stimpson											X
<i>Kurtziella limontella margaritifera</i> Olsson and Harbison				X				X			
<i>Kurtziella limontella</i> subsp.									X		
<i>Kurtziella stellata</i> Stearns											X
<i>Kurtziella</i> sp. a				X							
" <i>Kurtziella</i> " spp.				X				X			
<i>Lemintina decussata</i> (Gmelin)				X							
<i>Lemintina megintyi</i> Olsson and Harbison							X	X			
<i>Lemintina</i> sp.					X						
<i>Liostricata acuta</i> Sowerby								X			
<i>Longchaeus crenulatus</i> (Holmes)							X				

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
<i>Longchaeus</i> cf. <i>L. marionae</i> Bartsch				X						X	
<i>Longchaeus</i> sp. a						X					
<i>Longchaeus</i> sp.				X							
<i>Lucapina suffusa</i> Reeves											X
<i>Lucapina textaranea</i> Olsson and Harbison								X			
<i>Lucapinella limatula</i> Reeves											X
<i>Lucapinella talanteia</i> Olsson and Harbison								X			
<i>Macromphalina pierrot</i> Gardner								X			
? <i>Macromphalina</i> sp.								X			
<i>Mangelia cerinella</i> Kurtz and Stimpson											X
<i>Mangelia melantica</i> Bush								X			
<i>Mangelia</i> cf. <i>M. melantica</i> Bush											X
<i>Mangelia plicosa</i> C. B. Adams											X
<i>Mangelia quadrata</i> Reeve											X
<i>Marginella acusvesta</i> Olsson and Harbison							X	X			
<i>Marginella amiantula</i> Dall									X		
<i>Marginella apicina</i> Menke				X	X	X	X	X	X	X	X
<i>Marginella aureocincta</i> Stearns											X
<i>Marginella avena avenacea</i> Deshayes ?											X
<i>Marginella</i> cf. <i>M. bella</i> Conrad								X			X
<i>Marginella caloosana</i> Olsson and Harbison				X							
<i>Marginella</i> cf. <i>M. clenchi</i> M. Smith				X							
<i>Marginella denticulata</i> Conrad											X
<i>Marginella eulima</i> Dall				X		X					X
<i>Marginella floridana</i> Dall											X
<i>Marginella laevalleana</i> d'Orbigny											X
<i>Marginella limatula</i> Conrad							X				
<i>Marginella onchidella</i> Dall							X				X
<i>Marginella ovuliformis</i> d'Orbigny											X
<i>Marginella pallida</i> Donovan											X
<i>Marginella pardalis</i> Dall		X		X		X	X		X	X	X
<i>Marginella pinellasensis</i> Olsson and Harbison								X			
<i>Marginella polyspira</i> Olsson and Harbison				?				X			
<i>Marginella precursor</i> Dall				X							X
<i>Marginella prunum</i> Gmelin											X
<i>Marginella styria</i> Dall											X
<i>Marginella virginica</i> Conrad											X
<i>Marginella willcoziana</i> Dall							X	X			X

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
<i>Marginella</i> spp.				X		X					
<i>Meioceras cingulatum</i> Dall				X			X	X	X		X
<i>Meioceras nitidum</i> Stimpson ?								X			
<i>Meioceras</i> sp. a				X							
<i>Melanella calkinsi</i> Olsson and Harbison						X		X			
<i>Melanella conoidea</i> (Kurtz and Stimpson)								X			X
<i>Melanella conoidea nisoformis</i> Olsson and Harbison ?								X			
<i>Melanella locklini</i> Olsson and Harbison								X			
<i>Melanella</i> spp.		X		X		X					
<i>Melongena corona</i> Gmelin				X		X		X	X		X
<i>Menetis alabamensis avus</i> (Pilsbry) ?								X			
<i>Mitra heilprini</i> Cossman				X			X	X			X
<i>Mitramorpha cincta</i> Dall				X		X		X			X
<i>Modulus carchedonius</i> (Lamarek)				X	X			X	X		
<i>Modulus modulus</i> (Linné)							X				X
<i>Monilispira bigemma</i> (Dall)											X
<i>Monilispira leucocyma</i> (Dall)							X				X
? <i>Monilispira</i> cf. <i>M. leucocyma</i> (Dall)				X							
<i>Mormula</i> sp.										X	
<i>Murex brevisfrons</i> Lamarek				X			X		X		X
<i>Murex cellulosus</i> Conrad							X	X			X
<i>Murex macgintyi</i> M. Smith								X			
<i>Murex mesonius</i> Sowerby											X
<i>Murex pomum</i> Gmelin				X	X	X		X			X
<i>Murex recurvirostris rubidus</i> F. C. Baker				X				X	X		
<i>Murex salleanus</i> A. Adams				X		X		X			X
<i>Murex textilis</i> Gabb							X	X			X
<i>Murex</i> sp.				X							
? <i>Nannodiella</i> sp.				X							
<i>Nassarina dalli</i> Olsson and Harbison								X			
<i>Nassarina glypta</i> Bush							X				X
<i>Nassarius ambigua antillarum</i> d'Orbigny							X				X
<i>Nassarius bidentatus</i> (Emmons)				X		X	X	X			X
<i>Nassarius caloosaensis</i> Dall											X
<i>Nassarius consensus</i> (Ravenel)							X				X
<i>Nassarius</i> cf. <i>N. consensus</i> (Ravenel)							X				
<i>Nassarius floridensis</i> Olsson and Harbison				?		X					

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
<i>Scala sayana</i> Dall				X							
<i>Scaphella floridana</i> Heilprin							X	X			
<i>Sedilia acucinata</i> (Dall)				X							
? <i>Sedilia aphanitoma</i> (Dall)				X							X
<i>Sedilia hoplophorus</i> (Dall)											X
<i>Sedilia</i> cf. <i>S. hoplophorus</i> (Dall)				X		X					
<i>Sedilia</i> cf. <i>S. ochoida</i> Fargo						X					
<i>Sedilia piscator</i> (Dall)											X
<i>Sedilia podagrina</i> (Dall)											X
<i>Sedilia podagrina elongata</i> (Dall)											X
<i>Sedilia schmismatica</i> (Dall)							X				X
<i>Sedilia sedilia</i> (Dall)											X
<i>Sedilia sigela</i> (Dall)											X
? <i>Sedilia</i> sp.						X					
<i>Sedilia</i> sp. a				X							
<i>Seila adamsi</i> (H. C. Lea)							X	X	X	X	X
<i>Sigaretus carolinensis</i> Dall											X
<i>Sigaretus multiplicatus</i> Dall											X
<i>Sigatica semisulcata</i> Gray								X			
<i>Sinum polandi</i> M. Smith								X			
<i>Smaragdia merida</i> Dall							X	X			
<i>Solariorbis funiculus</i> (Dall)				X				X			X
<i>Solariorbis opistelotus</i> (Dall)							X	X			X
<i>Strombiformis dalli</i> Gardner and Aldrich							X	X			
<i>Strombiformis</i> cf. <i>S. biconica</i> Gardner								X			
<i>Strombina gunteri</i> Mansfield								X			
<i>Strombus alatus</i> Gmelin		X		X	X	X	X	X	X		X
<i>Strombus leidyi</i> Heilprin				X							X
<i>Strombus pugilis</i> Linné				X							X
<i>Succinea luteola</i> Gould								X			
<i>Sulcularia prosulcata</i> Gardner				X				X			
<i>Syntomodrillia</i> cf. <i>S. scissurata</i> (Dall)				X							X
<i>Tectonatica pusilla</i> (Say)		X		X		X	X	X		X	X
<i>Tectonatica</i> sp.							X				
<i>Tegula fasciatum</i> (Born)								X			
<i>Teinostoma</i> cf. <i>T. altum</i> Pilsbry						X					
<i>Teinostoma calliglyptum</i> Dall						X	X				
<i>Teinostoma carinicallus</i> Pilsbry and McGinty								X			

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Gastropoda (Continued)											
<i>Teinostoma</i> cf. <i>T. cocolitoris</i> Pilsbry and McGinty				X							
<i>Teinostoma cryptospira</i> Verrill				X							
<i>Teinostoma goniogyrrus</i> Pilsbry and McGinty								X			
<i>Teinostoma milium</i> Dall				X			X				
<i>Teinostoma tectispira</i> Olsson and Harbison		X		X		X		X			
<i>Terebra concava</i> (Say)						X	X		X		X
<i>Terebra dislocata</i> Say				X		X	X	X	X	X	X
<i>Terebra protezta</i> Conrad											X
<i>Terebra</i> sp. a						X					
<i>Terebra</i> spp.				X		X			X		
<i>Tricolia umbilicata</i> (d'Orbigny)							X				
<i>Triforis mirabilis</i> C. B. Adams							X				
<i>Triforis modesta</i> C. B. Adams							X				X
<i>Triforis nigrocincta</i> C. B. Adams							X				X
<i>Trigoniostoma sericea</i> (Dall)				X			X	X			X
<i>Trigoniostoma tenera</i> (Philippi)							X	X			X
<i>Triphora bartschi</i> (Olsson)								X			
<i>Triphora bolax</i> Olsson and Harbison						X					
<i>Trivia floridana</i> Olsson and Harbison				X				X			
<i>Trivia islahispaniolae petrela</i> Olsson and Harbison								X			
<i>Trivia globosa</i> Gray											X
<i>Trivia pediculus</i> (Linné)						X		X			X
<i>Trivia suffusa</i> Gray							X				X
<i>Trivia</i> sp. a new ?								X			
<i>Trophon lepidota</i> (Dall)		X		X				X			X
<i>Turbo castaneus</i> Gmelin				X			X				X
<i>Turbo castaneus crenulatus</i> Gmelin						X	X				
<i>Turbo rhexogrammicus</i> Dall				X			X				X
<i>Turbonilla</i> 2 sp.							X				
<i>Turbonilla</i> (<i>Chemnitzia</i>) cf. <i>T. admeta</i> Bartsch										X	
<i>Turbonilla</i> (<i>Chemnitzia</i>) sp.							X				
<i>Turbonilla</i> (<i>Chemnitzia</i>) sp. a						X					
<i>Turbonilla</i> (<i>Chemnitzia</i>) 4 sp.							X				
<i>Turbonilla</i> (<i>Dunkeria</i>) sp.							X				
<i>Turbonilla</i> (<i>Strioturbonilla</i>) sp.							X				
<i>Turbonilla</i> sp. a				X							
<i>Turbonilla</i> spp.				X		X			X	X	

Species	Distribution										
	T	B	C	D	E	F	L	X	A1	A2	M
Castropoda (Continued)											
<i>Turritella apicalis</i> Heilprin		X	X	X	X		X	X			X
<i>Turritella apicalis cingulata</i> Heilprin											X
<i>Turritella apicalis mediosulcata</i> Heilprin											X
<i>Turritella apicalis tensa</i> Dall							X				
<i>Turritella perattenuata</i> Heilprin		X		X	X		X	X			X
<i>Turritella perattenuata obsoleta</i> Dall											X
<i>Turritella pontoni</i> Mansfield	X			X				X			
<i>Turritella</i> sp. a	X										
<i>Turritella subannulata</i> Heilprin		X		X		X			X		X
<i>Turritella subannulata acropora</i> Dall								X			X
<i>Turritella subannulata burnsi</i> Dall							X	X			X
<i>Turritella subannulata princisa</i> Dall											X
<i>Turritella wagneriana</i> Olsson and Harbison				X				X			
<i>Typhis floridanus</i> Dall				X				X			X
<i>Urgartea locklini</i> Bartsch								X			
<i>Urosalpinx perrugatus</i> Conrad						X		X			X
<i>Urosalpinx</i> sp. a								X			
<i>Urosalpinx subsidus</i> Dall				X			X	X			X
<i>Urosalpinx trossulus</i> Conrad							X				X
<i>Vasum horridum</i> Heilprin				X			X	X			X
<i>Vasum locklini</i> Olsson and Harbison							X				
<i>Vermetus</i> sp.								X			
<i>Vermicularia recta</i> Olsson and Harbison				X				X	X		
<i>Vermicularia</i> sp.		X		X							
<i>Vermicularia spirata</i> Philippi						X	X				X
<i>Vermicularia woodringi</i> Olsson and Harbison								X			
<i>Vexillum healyi</i> Fargo								X			
<i>Vexillum holmesi</i> (Dall)								X			
<i>Vexillum</i> sp. a new ?								X			
<i>Vexillum willcoxi</i> (Dall)								X			
<i>Vitricythara elata</i> (Dall)								X			
<i>Vitricythara micromeris</i> (Dall)							X				X
<i>Viviparus georgianus</i> (Lea)							X	X			
<i>Volvula tritica</i> Olsson and Harbison				X							
<i>Xancus regina</i> (Heilprin)				X			X	X			X
<i>Xancus scolymoides</i> Dall				X			X				X
<i>Xenophora conchyliophora</i> Born							X	X			X

**OSTRACODE CHECK LIST FROM THE CALOOSAHATCHEE
MARL ON SHELL CREEK, CHARLOTTE COUNTY, FLORIDA**

(Identified by H. Puri, 1959)

	Unit D	Unit F		Unit D	Unit F
<i>Actinocythereis exanthemata</i> (Ulrich and Bassler)	*		<i>Cytherura</i> n. sp.		*
<i>Acuticythereis laevissima</i> (Edwards)	*	*	<i>Cytherura wardensis</i> Howe and Brown		*
<i>Aurila conradi</i> (Howe and McGuirt)	*	*	<i>Haplocytheridea bassleri</i> Stephenson	*	
<i>Campylocythere</i> sp.		*	<i>Hulingsina ashermani</i> (Ulrich and Bassler)	*	*
<i>Climacoidea pleurata</i> Puri	*	*	<i>Loxoconcha doryandae</i> Puri	*	
<i>Climacoidea</i> sp.	*		<i>Loxoconcha reticularis</i> Edwards	*	*
<i>Cyprideis</i> sp.	*		<i>Reticulocythereis floridana</i> Puri		*
<i>Cytheretta sahnii</i> Puri	*		<i>Orionina bermudae</i> (Brady)	*	
<i>Cytheromorpha warneri</i> Howe and Spurgeon		*	<i>Puriana</i> n. sp.		*
<i>Cytherura elongata</i> Edwards	*		<i>Puriana rugipunctata</i> (Ulrich and Bassler)	*	*
<i>Cytherura johnsoni</i> Mincher		*			

**FORAMINIFERAL CHECK LIST FOR THE SHELL
CREEK CALOOSAHATCHEE MARL**

(All Unit D species from SC8-1a; all Unit F species from SC1-1; Cole's collection is from 3½ miles upstream from Washington's place.)

Species	Unit D	Unit F	Cole, 1931	Species	Unit D	Unit F	Cole, 1931
<i>Amphistegina gibbosa</i> d'Orbigny			X	<i>Globigerina</i> sp.		X	
<i>Angulogerina occidentalis</i> (Cushman)	X	X		<i>Guttulina problema</i> d'Orbigny			X
<i>Archaias angulataus</i> (Fichtel and Moll)			X	<i>Lagena substriata</i> Williamson		X	
? <i>Articulata</i> sp.		X		<i>Loxostoma gunteri</i> Cushman			X
<i>Astaculus</i> sp.	X			<i>Orbulina universa</i> d'Orbigny			X
<i>Bolivina floridana</i> Cushman	X	X		<i>Peneropolis proteus</i> d'Orbigny			X
<i>Bolivina pulchella primitiva</i> Cushman		X		<i>Quinqueloculina fusca</i> H. B. Brady			X
<i>Bolivina</i> sp. a		X		<i>Quinqueloculina lamarckiana</i> d'Orbigny	X		
<i>Buccella hannai</i> Phleger and Parker		X		<i>Quinqueloculina seminula</i> (Linné)	X		X
<i>Cibicides depressus</i> Phleger and Parker ?	X			<i>Quinqueloculina subpoejana</i> Cushman ?	X		
<i>Cibicides floridanus</i> (Cushman)	X	X		<i>Quinqueloculina</i> sp. a		X	
<i>Cibicides</i> 10		X		<i>Quinqueloculina</i> spp.	X	X	
<i>Cibicides</i> sp.		X		<i>Reussella spinulosa</i> (Ruess)		X	
<i>Discorbis floridana</i> Cushman		X		<i>Rotalia beccarii</i> Linné	X	X	
<i>Discorbis floridensis</i> Cushman		X		<i>Rotalia beccarii</i> (Linné) var. <i>ornata</i> Cushman			X
<i>Discorbis</i> sp.		X		<i>Rotalia beccarii</i> (Linné) var. <i>tepida</i> Cushman			X
<i>Elphidium discoidale</i> (d'Orbigny)	X			<i>Sorites marginalis</i> (Lamarck)		X	
<i>Elphidium fimbriatulum</i> (Cushman)	X	X		<i>Spiroloculina dentata</i> Cushman and Todd	X		
<i>Elphidium gunteri glavestonensis</i> Kornfeld			X	<i>Spiroloculina reticulosa</i> Cushman		X	
<i>Elphidium incertum</i> (Williamson)			X	<i>Triloculina linneiana</i> d'Orbigny var. <i>caloosahatcheensis</i> Cole		X	
<i>Elphidium incertum mexicanum</i> Kornfeld	X	X		<i>Vertebralina cassis</i> d'Orbigny		X	
<i>Elphidium</i> sp.		X					

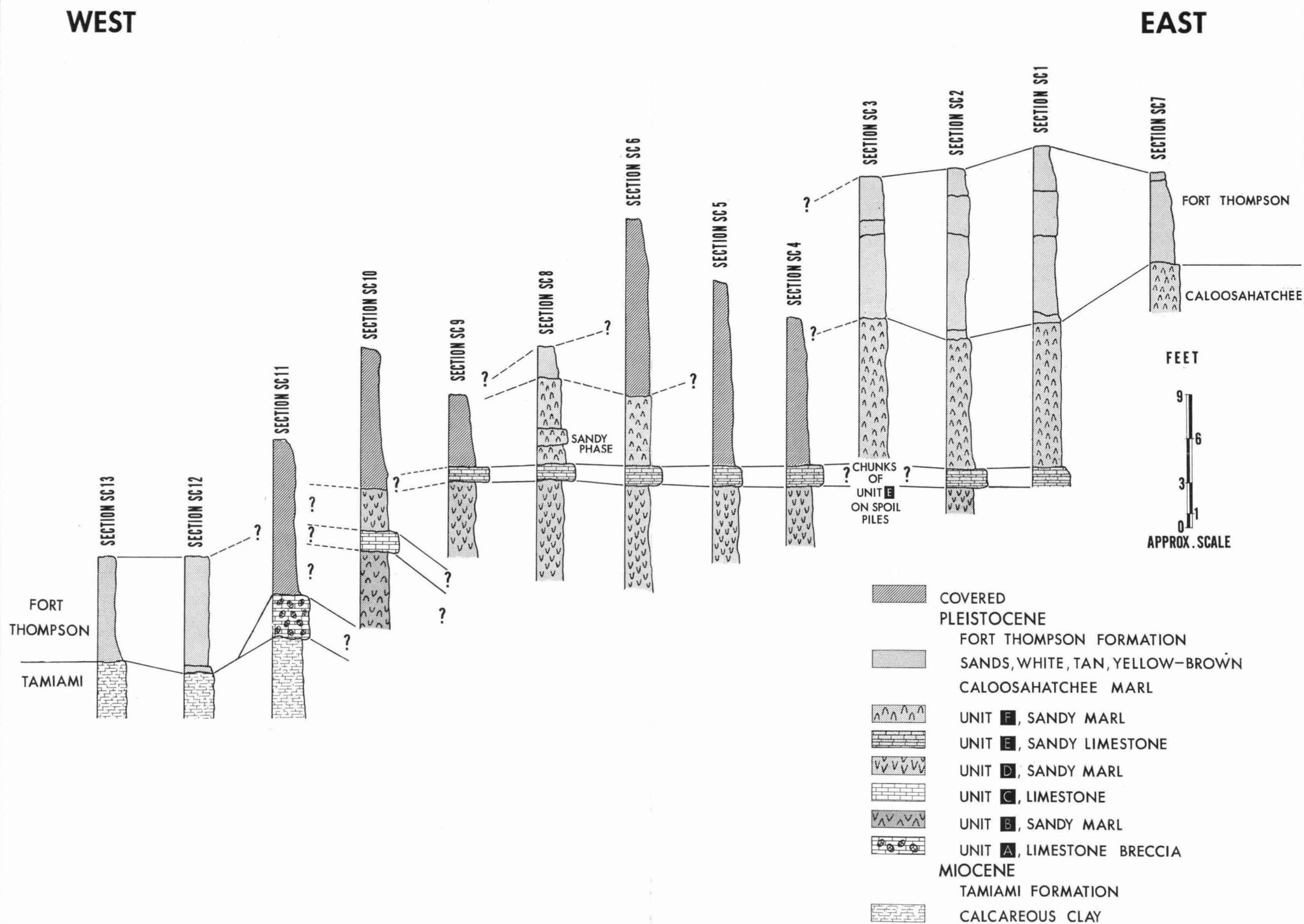


Plate I. Correlation of measured sections on Shell Creek, Florida.

