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FOSSIL WOOD FROM BAYOU PIERRE AND WHITE OAK CREEK, SOUTHWEST-CENTRAL MISSISSIPPI

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INTRODUCTION

The Bayou Pierre drainage (Fig. 1) along the Copiah/Claiborne County line (Utica West and Carlisle Quadrangles), in particular the gravel bar area immediately west of Carlisle, has been visited frequently by rock and gem collectors. The gravel bar locality, specifically, is on the field trip list for the Mississippi Gem and Mineral Society (see *Rocky Echoes,* v. 19, no. 1, p. 14, 1978), and is noted for occurrences of fossil wood—especially fossil palm "wood." Although doubtless less familiar to collectors, the nearby White Oak Creek channel (Hinds, Copiah and Claiborne County border) also contains fossil wood. Separated by a narrow upland, White Oak Creek empties into Bayou Pierre just before Bayou Pierre passes from Copiah into Claiborne County. Because of the close association of White Oak Creek and Bayou Pierre, the two drainages are considered together in this paper. To our knowledge, no identification other than "palm wood"' of some sort or other has been applied in writing to any silicified wood specimens coming from this combined drainage system. Most specifically, perhaps, Berry (1916) noted the occurrence of *Palmoxylon cellulosum* Knowlton from Bayou Pierre along the Copiah/Claiborne line, among several other scattered localities.

The age and source of fossil wood in Mississippi has been the subject of debate. Wood of Pleistocene age is known from the state (Blackwell and Dukes, 1981; Blackwell, 1982). However, the occurrence of probable older fossil wood, e.g., Oligocene age, is also documented (Blackwell et al., 1981; Blackwell, 1983). In this regard the Bayou Pierre/White Oak Creek drainage is problematical in that stream downcutting and reworking has mixed Holocene and Pleistocene materials (terrace gravels and sands) with rock fragments from older strata, i.e., the Catahoula Sandstone-interpreted variously as Oligocene (Matson, 1916) and Miocene (Bicker et al., 1966; 1969). Because of this mixture, the structure and identities of the fossil woods themselves may actually in the case of Bayou Pierre/ White Oak Creek provide the best guides to their particular ages. As a general rule of thumb, woods of Pleistocene age (no more than one million years old) will be more directly comparable to extant woods and show more pronounced growth rings than will woods of Oligo-Miocene age (see Blackwell and Dukes, 1981, vs. Blackwell et al., 1981). In the case of Pleistocene-age petrified woods, the situation may be additionally complicated by the possibility of arrival of the material from a different provenance (i.e., coming in as driftwood from the north) as opposed to a more or less *in situ* origin. The considerable alluviation associated with the combined ancestral Mississippi and Ohio Rivers during the Pleistocene (Fisk, 1944) could have produced fossil wood locally or carried it in from afar. In spite of these difficulties, the Bayou Pierre drainage *(sensu lato)* is interesting in that in all probability the remains of at least two quite distinct floras of the past are represented.

MATERIALS AND METHODS

Mindful of potential confusion over geologic source and age, fossil woods were collected (Fig. 2) by the authors during several trips to Bayou Pierre and/or White Oak Creek. These woods were subsequently sectioned in a laboratory of the Department of Geology, Miami University (Ohio). Specimens were cut to suitable size on a large trim saw, polished on diamond lapidary heads, dried, and mounted with epoxy onto glass microscope slides. After hardening of the epoxy, specimens were thin-sectioned with a cut-off saw and polished to desired transparency on a grinding wheel. Coverslips were applied with epoxy, permitting photomicrography. All specimens and slides are deposited in the paleobotanical collections associated with the Herbarium at Miami University.

The majority of woods determined in this study may be identified microscopically by use of standard references on wood technology and/or identification, e.g., Barefoot and Hankins (1982), Panshin and de Zeeuw (1980). In a few instances, however, a more specialized literature must be consulted, e.g., Berry (1916), Blackwell et al. (1981). It is quite difficult, in fact usually impossible, to identify these or other fossil woods without the benefit of microscopic thin-sections.

RESULTS AND DISCUSSION

Irrespective of problems in determining probable age and origin, a nice diversity of woods (10 different kinds in all) was discovered in the course of sectioning approximately 35 different sample specimens. The preservation state (siliceous replacement) was generally quite good and the variety encountered aesthetically pleasing under the microscope. Although it is impossible in some cases to be totally sure, the identifications itemized below are subdivided according to our belief as to whether the woods are Pleistocene (comparable to extant taxa) or date considerably farther back in the geologic record. See Figures 3-12 for photomicrographs of each wood type listed. All are shown in cross-section, and all are x170 magnification.

Probable Pleistocene age woods found:

Dicotyledonous woods comparable to:
- *Acer* (maple: soft maple type, i.e., red or silver maple)
- *Juglans* (black walnut)
- *Maclura* (osage orange)
- *Morus* (mulberry)
- *Ostrya* (hop-hornbeam)
- *Quercus* (oak: red oak type)

Figure Legends

Figure 1. Field shot of Bayou Pierre drainage (immediately west of Carlisle, Mississippi) during low water level; note terrace gravel and sand material in foreground, among which fossil wood specimens may be collected.

Figure 2. Sample collection of fossil wood specimens from Bayou Pierre.

Figure 3. Photomicrograph of fossil maple wood (*Acer*), soft maple type.

Figure 4. Fossil black walnut wood (*Juglans*); note large, solitary, earlywood vessels (arrows).

Figure 5. Fossil wood of osage orange (*Maclura*); note characteristic strong band of parenchyma tissue (between arrows) extending out from vessel (below).

Figure 6. Fossil mulberry wood (*Morus*); note characteristic clustering of smaller vessels (arrow) in latewood region.


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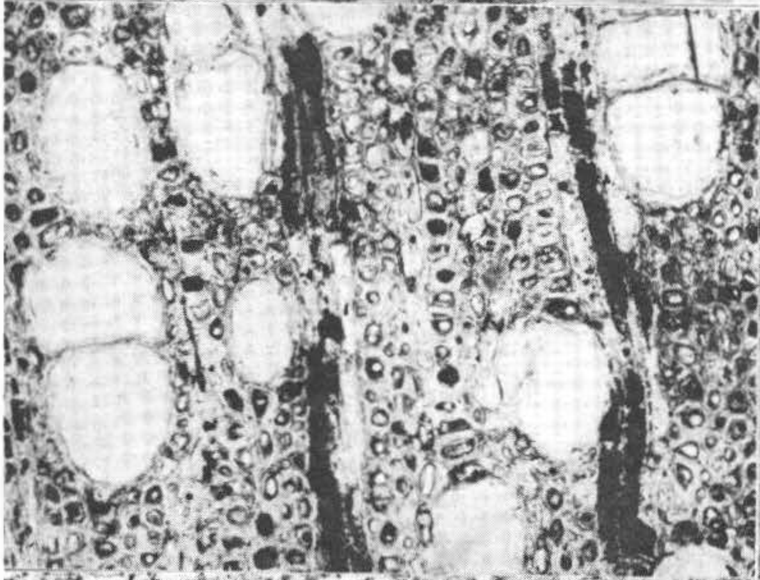

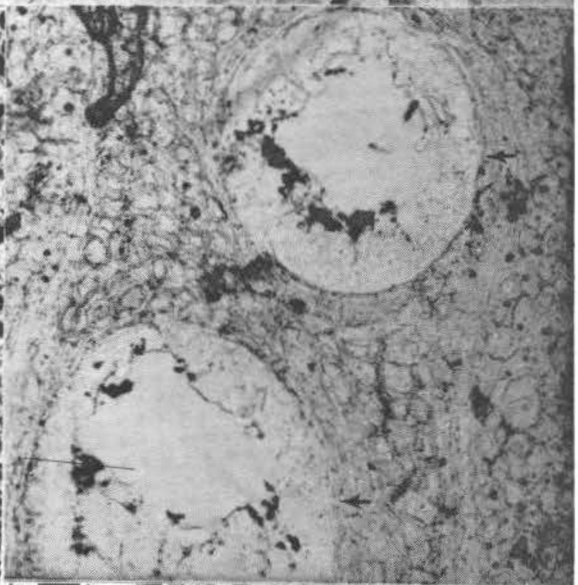

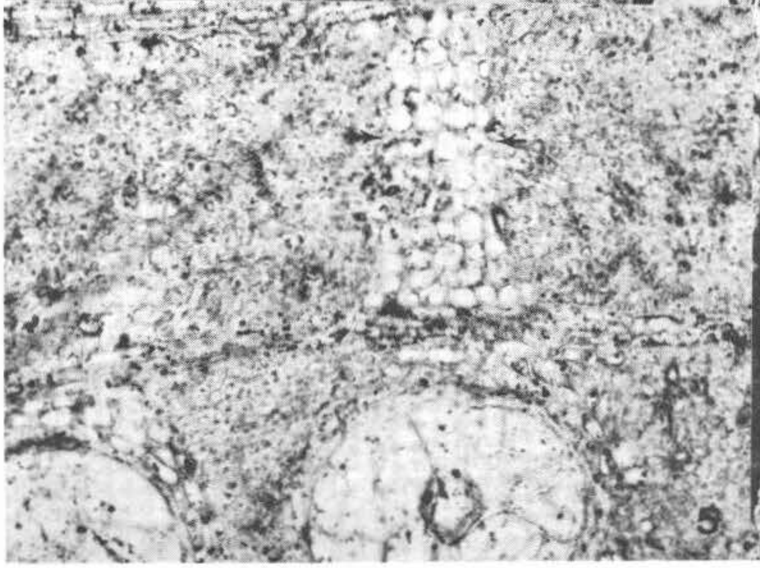
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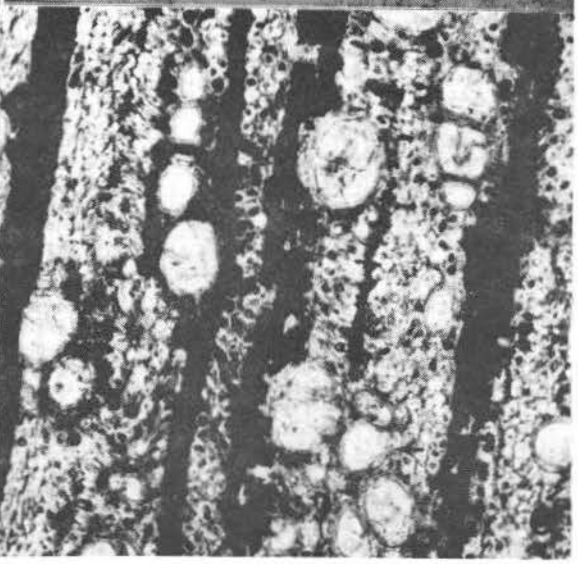

Coniferous woods comparable to:
Taxodium (bald cypress)
Taxus (yew)

Probable older (Oligo-Miocene) woods:

Floroxylon (dicotyledonous, spurge-like wood)
Palmoxylon (fossil palm "wood," i.e., monocotyledonous wood)

Some of the probable Pleistocene-aged fossil woods found in the Bayou Pierre/White Oak Creek drainage, e.g., soft maple and hop-hornbeam, are similar (or virtually identical) to silicified woods encountered at other Pleistocene sites in Mississippi (Blackwell and Dukes, 1981; 1982). Others, such as mulberry and osage orange, apparently represent first published reports (as fossils) for the state. All the types of putative Pleistocene fossil woods found in this study cannot be distinguished from woods of respective extant genera, or even species.

Regarding geologically older woods, the *Floroxylon* (spurge family) material from Bayou Pierre compares well microscopically with samples of *Floroxylon* (Oligocene age) from the Mississippi Petrified Forest, near Flora, Mississippi (Blackwell et al., 1981). It is not illogical that *Floroxylon*-like material would occur at Bayou Pierre, given the mixing of older and younger rock pieces as a result of stream reworking. The same situation should apply to *Palmoxylon* as well. We concur with the indication of association of *Palmoxylon* with the Catahoula Sandstone by both Berry (1916) and Bicker et al. (1969). Although the final verdict on the geologic age and association of *Palmoxylon* from this locality is not in, we found one specimen of *Palmoxylon* virtually in place at an exposure of Catahoula Sandstone, in the apparent absence of Pleistocene terrace materials. However, additional fieldwork hopefully will provide ultimate clarification of the proper stratigraphic correlation of *Palmoxylon*. It should be noted that the *Palmoxylon* material sectioned in this investigation is not precisely equatable with *P. cellulosum* reported by Berry (1916) from Bayou Pierre.

ACKNOWLEDGMENTS

We wish to thank Audrey Chang for her assistance in sectioning some of the specimens collected.

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Figure Legends

Figure 7. Photomicrograph of fossil hop-hornbeam wood (*Ostrya*); note angular (oblique) pattern of vessel distribution (in direction of arrows below).

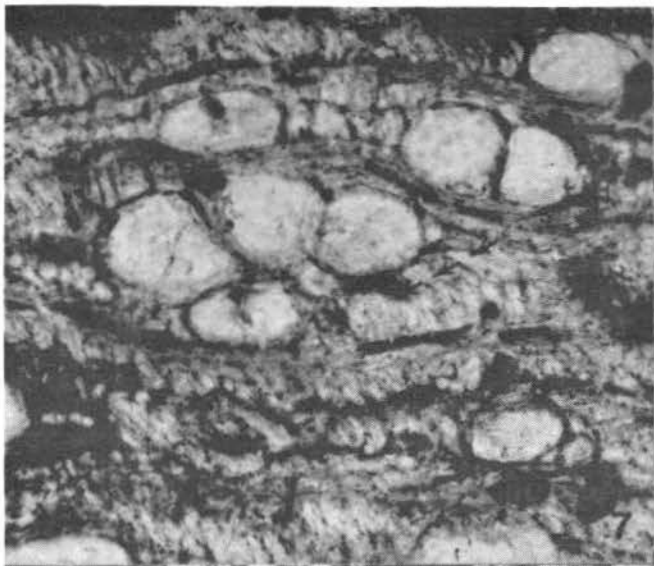
Figure 8. Earlywood zone of growth-ring of fossil oak wood (*Quercus*), red oak type; note characteristic large ray (arrows passing through middle), and large earlywood vessel below.

Figure 9. Fossil wood of bald cypress (*Taxodium*); resin cells (arrow pointing to one) are scattered among the tracheids.

Figure 10. Wood of fossil yew (*Taxus*); note thicker walled tracheids and absence of resin cells; slight growth-ring runs vertically through center of micrograph.

Figure 11. *Floroxylon*-type wood; this wood is comparable to type found at Mississippi Petrified Forest.

Figure 12. *Palmoxylon* "wood"; micrograph is taken at midportion of a large vascular bundle; note two large vessels (upper left).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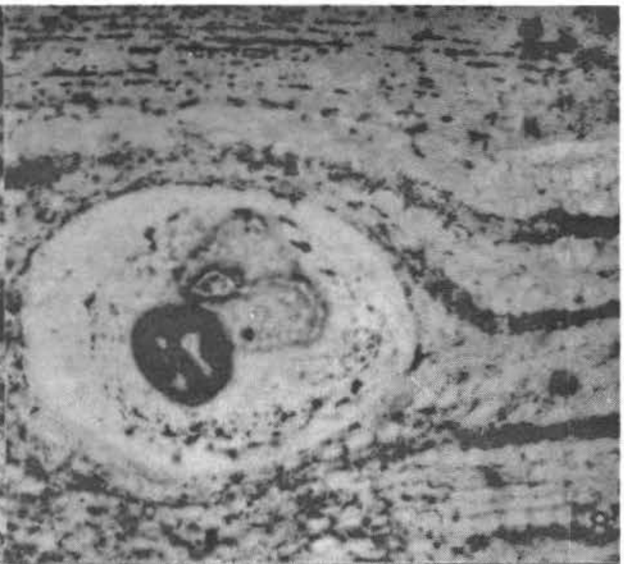
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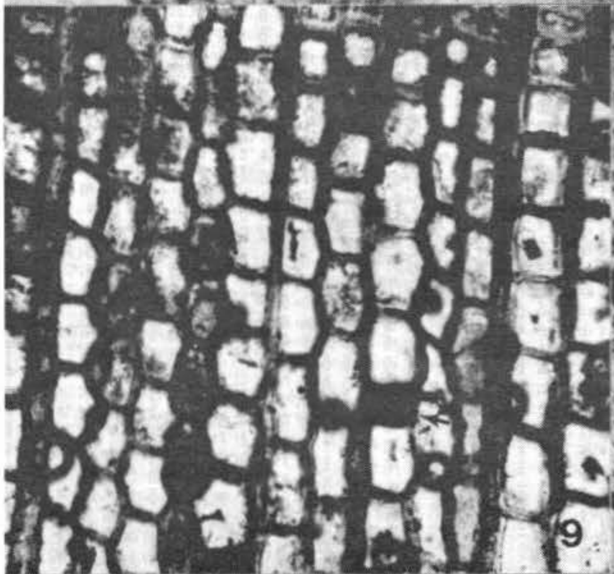
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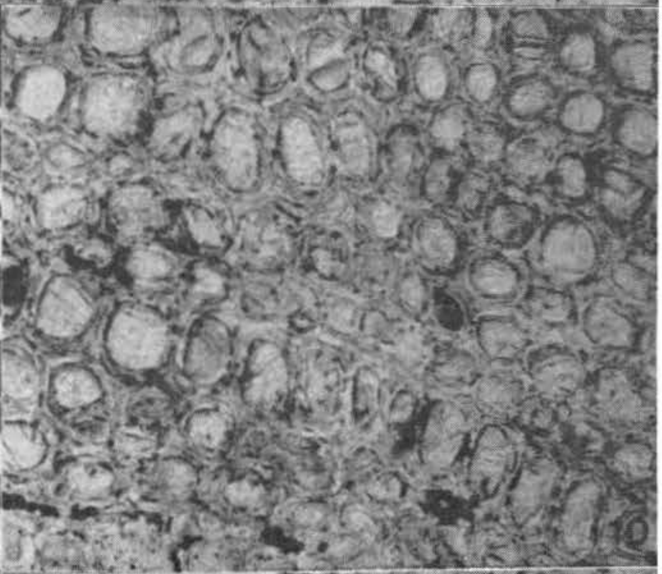
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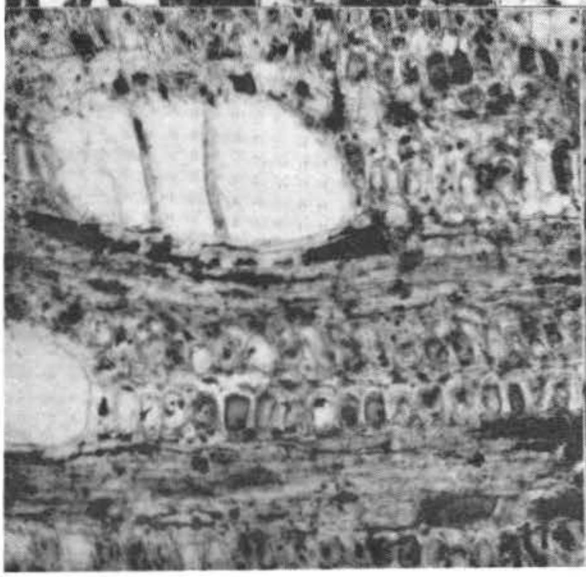
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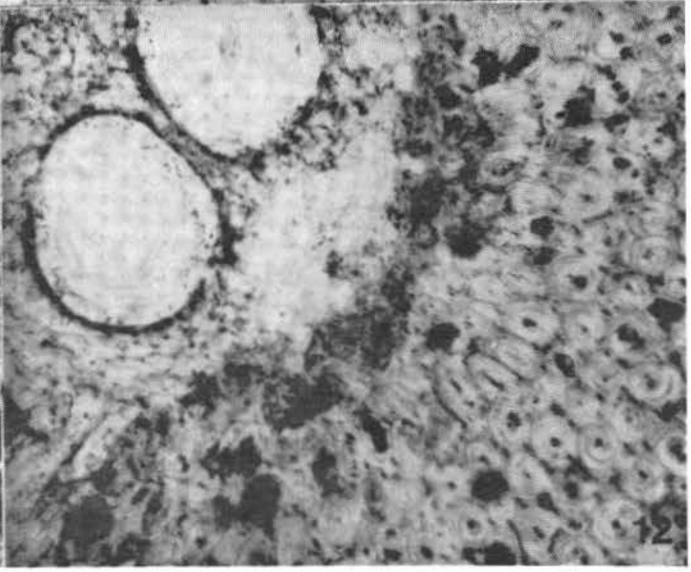
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CALENDAR OF EVENTS

1984 January - April

January 23-27 - Ocean Sciences, mtg, New Orleans. (American Geophysical Union, 2000 Florida Ave., NW, Washington, D.C. 20009)

February 15-18 - Society of Independent Professional Earth Scientists, mtg, Carefree, Arizona. (Evelyn W. Moody, SIPES headquarters, Box 3370, Midland, Texas 79702. Phone: 915/697-4338)

February 21-22 - Mississippi Surface Mining and Reclamation Symposium, Jackson. (Mining Symposium, Mississippi Bureau of Geology, P.O. Box 5348, Jackson, Miss. 39216. Phone: 601/354-6228)

February 23-24 - Mississippi Academy of Sciences, annual meeting, Biloxi. (MAS, 520 North President St., Jackson, Miss. 39201. Phone: 601/353-6527. Chairman, Geology and Geography Division: Troy J. Laswell, Box 5167, Mississippi State, Miss. 39762. Phone: 601/325-3915)

February 25-26 - Mississippi Gem and Mineral Society, 25th Anniversary Show, A & I Buildings, State Fairgrounds, Jackson. (Miss. Gem and Mineral Society, Box 844, Jackson, Miss. 39205. Show chairman: Billy Scruggs, 601/362-5481)

March 26-27 - South-Central Section, Geological Society of America, ann. mtg, Dallas. (Jean M. Latulippe, GSA headquarters, Box 9140, Boulder, Colorado 80301. Phone: 303/447-2020)

April 4-6 - North-Central and Southeastern Sections, Geological Society of America, ann. mtgs, Lexington, Kentucky. (Jean M. Latulippe, GSA headquarters, Box 9140, Boulder, Colorado 80301. Phone: 303/447-2020)

NOTES ON THE LOWER OLIGOCENE OYSTERS OF MISSISSIPPI

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INTRODUCTION

The report on the bivalves of the lower Oligocene beds of Mississippi by the junior author (Dockery, 1982) posed certain questions about the oysters to the senior author, who has been concentrating on a systematic study of living oysters for several years. Specifically, these questions were: (1) whether or not certain species had a 'vesicular' shell structure; (2) details of the shape of the adductor muscle scars; and (3) the type of the marginal denticles, or chomata. These questions were resolved by a reexamination of Vicksburg oyster specimens. A summary of oyster shell formation, morphology, and classification is given here and is followed by a revision of the lower Oligocene oysters of Mississippi.

OYSTER SHELL FORMATION AND MORPHOLOGY

For greater appreciation of the matters involved in oyster systematics, an explanation of certain aspects of shell formation in oysters is in order. In initiating shell formation, a thin organic sheet, the periostracum, is produced along the very edge of the mantle, which is a thin sheet of flesh subtending the inner surface of the shell. The periostracum is attached to the margin of the shell previously formed, and it forms a thin coat over the subsequent shell as that is produced.

While the periostracum is present, it forms a barrier wall, isolating the forming shell from the external environment, and allowing physiological control of the minute space where the new shell is being made.

An outer calcareous layer, consisting of minute prisms which are perpendicular to the shell's surface, extends the margin of the shell. Whereas the organic periostracum is quickly worn away as the shell increases, the prismatic layer is persistent in all oysters, although often extensively abraded, so that it is difficult to observe. Stenzel's (1971, p. N979, N1105) statement, that the prismatic layer is absent in all pycnodontine genera except *Neopycnodonte,* is not correct. This layer extends from the general shell surface as thin lamellae in some species, which Stenzel (1971, p. N977 *ff*) incorrectly refers to as "conchiolin scales or lamellae."

Farther inward from the margin, between the mantle and prismatic layer, the inner layer of calcareous shell is produced, thickening the valve. This layer is secreted as very thin, small pads, polygonal or subcircular. The prismatic layer is only as thick as the length of the prisms, and formed of a single layer of them, but the foliar layer is continuously if irregularly produced, forming a layer of variable thickness. When thin, the foliar layer is glassy or porcellaneous, translucent to nearly transparent. However, one to four kinds of interruptions may occur within the foliar layer, so that it may be very heterogeneous in composition and opaque. (1) The shell layer under the adductor muscle, or myostracum, is a continuous sheet, expanding in area from a minute apex at the umbo (the beginning of the post-larval shell) as a thin, arched sheet, to end at the attachment of this large muscle, which itself expands and moves ventrad as the shell grows. The myostracum grossly resembles the material of the foliar layer. It is always present, and all of it, except the part to which the muscle is attached, is imbedded within the foliar layer.

The other three types of interruptions may be absent, or present in various combinations, according to the species. (2) The mantle may be pulled away over a broad area from the inner shell layer, and then secrete additional foliar material, leaving a cavity or chamber between the two foliar layers. This usually happens in areas of greater curvature in either valve, in the species in which it occurs. It is sometimes used to fill the inner ends of troughs between plications in plicate shells, thus smoothing the shell's inner surface. (3) Sheets of organic material, conchiolin, are produced in some species on the inner surface of the shell. These are of variable thickness, and in living oysters they are greenish when thin, light to dark brown as they become thicker. Irregular in shape, they are covered by additional layers of foliar material, through which they appear as greenish or brownish washes. Organic sheets are formed in species which have very erodable shells, and as an initial covering over boring pests which penetrate to the inner surface of the shell (some sponges; mudworms; bivalves of the families Pholadidae and Mytilidae).

(4) Chalky deposits are the most prominent type of the intercalated interruptions in the foliar shell layers. Also variable in position, thickness and shape, these deposits are opaque, pure white, and they seem to be of amorphous rather than crystalline calcium carbonate. These deposits are of two sub-types. In some species they have closely spaced, polygonal, equidimensional cavities, or vesicles, the walls of which are formed by the chalky material. Magnification of at least 10x is needed to see the vesicles, which resemble a minute honeycomb. In the second sub-type the chalky deposits show no cavities at any magnification of the light microscope, and they have therefore been termed non-vesicular. But a recent study of the shell structure of *Crassostrea virginica* by Carriker, Palmer and Prezant (1980), using the electron microscope, shows that the non-vesicular deposits in that species also have cavities, only they are too small to be seen at lower magnification. Perhaps the two sub-types would better be termed macrovesicular and microvesicular, but until comparative studies are made on other oysters, and for the sake of simplicity, we will continue to call the sub-types vesicular and non-vesicular.

Oyster shells are edentate, lacking interlocking hinge teeth of the types found in other bivalves. However, in most species there are small marginal pultules or ridges, chiefly near the ligament, but sometimes extending ventrad for varying distances, even completely across the ventral margin. These were termed chomata by Stenzel (1971, p. N1029), who often used the term in a broader sense than given in his definition.

SUMMARY OF OYSTER SYSTEMATICS

The history of oyster systematics was reviewed by Stenzel (1971), who evaluated and extended the classification considerably. The senior author has found that the anatomies of the flesh of living oysters, of which he has been able to examine most species, confirm Stenzel's arrangement in most particulars. Rearranging a few of the taxa has been found necessary (Harry, 1981a). Torigoe (1981) has named the subfamily Crassostreinae, a natural grouping recognized by Stenzel but not named by him. Several fundamental characters of the flesh support Stenzel's conclusion that two families should be recognized (Harry, 1981b). On the basis of shell characters, the following suprageneric taxa are recognizable:

Family Gryphaeidae Vyalov, 1936.

Muscle scar subcircular.

Subfamily Gryphaeinae Vyalov, 1936 (Triassic-Jurassic)

Commissural shelf (around the shell margin) poorly defined; no chomata; chalky deposits not vesicular; the three divisions of the ligamental area equal in size; left valve may be planispirally coiled (orthogyrous, like *Nautilus*), the right valve flat or nearly so.

Subfamily Exogyrinae Vyalov, 1936 (Jurassic-Miocene)

Chomata often present, varied, chiefly vermiculate or modifications thereof; commissural shelf variable, often well defined; chalky deposits not vesicular; umbo of left valve inflated, opisthogyrous, coiled in several planes, right valve flat or nearly so; posterior bourrelet (hindermost of three divisions of ligamental area) much reduced, often merely a narrow ridge.

Subfamily Pycnodonteinae Stenzel, 1959 (Lower Cretaceous-Recent)

Commissural shelf usually well developed; chomata generally present, vermiculate near ligament, or modifications of that type; umbos only slightly spiraled, if at all; divisions of the ligamental area of equal size; chalky deposits vesicular.

Family Ostreidae Rafinesque, 1815.

Muscle scar reniform (concave on dorsal margin) or gibbous (only flattened dorsally); commissural margin not well defined; chalky deposits, when present, not vesicular; chomata when present never vermiculate; umbos usually slightly opisthogyrous, sometimes orthogyrous or prosogyrous in a single population; left umbo sometimes enlarged but rarely as strongly spiraled as in some Gryphaeidae (some fossils); three parts of ligamental area of equal size.

Subfamily Lophinae Vylaov, 1936 (Upper Triassic-Recent)

Both valves, or rarely left valve only, radially plicate, with zigzag marginal commissure; chalky and organic deposits usually absent, but frequent empty chambers are formed, particularly in smoothing out the troughs between plicae internally. Chomata often of lophine type, *i.e.*, numerous small pustules in closely set rows normal to margin, without sockets to receive them in opposite valve; these occur in both valves or right valve only, usually well below the ligament, often extending, sometimes with interruptions, completely around the margin. Ostreine chomata sometimes present, alone or near the ligament when lophine chomata also occur: these are in a single row of pustules or short ridges normal to margin, always in the right valve, with pits to receive them in the left one.

Subfamily Ostreinae Rafinesque, 1815 (Lower Cretaceous-Recent)

Shells more compressed than in the next subfamily, generally subcircular or subtriangular, with plications often well defined but limited to left valve, marginal commissure rarely zigzag; chomata generally present, of ostreine type only, sometimes disappearing in larger specimens; chalk deposits abundant, organic deposits occasional, but chambering rare or absent.

Subfamily Crassostreinae Torrigoe, 1981 (Lower Cretaceous-Recent)

Shells usually elongate dorso-ventrally, occasionally plicate (regularly in *Saccostrea*, indifferently so in *Striostrea* and *Crassostrea*) on left valve, which is usually inflated; right valve very rarely plicate, usually flat; chomata generally present (except *Crassostrea*), of ostreine type only, sometimes absent in larger specimens; chalk and organic deposits abundant, and chambering frequent, especially in left valve, often producing very thick valves.

REVISED SYSTEMATICS OF THE VICKSBURG OYSTERS

The three subfamilies of Ostreidae are more sharply differentiated from each other and from the living Pycnodonteinae by the anatomy of their flesh, their reproductive habits and environmental preference than by characters of the highly variable shells. The reexamination of the lower Oligocene oysters reported by Dockery (1982) in the light of the above indicates that some modification of nomenclature is warranted.

Most abundant are two species which have vesicular chalk deposits, although in many specimens they are scarcely evident without careful search for some abraded spot. In others the deposits might easily be mistaken for encrusting bryozoa, or they are obscured by extraneous deposits and physical modifications of the shell. Similar difficulties are encountered in determining the position and shape of the adductor muscle scar. In many fossil oysters the myostracum is peculiarly flaky around its exposed margin, and irregularly worn away. The ventral margin is always convex, and the muscle itself glides along in a saltatory fashion during growth, leaving several 'halt marks'; when the dorsal margin is flaked away, these halt marks may cause the originally circular scar to appear concave dorsally (*i.e.*, reniform). The chomata are likewise often obscure in these fossils, but where they are not, they demonstrate how the ostreine type may be derived from the vermiculate type. Chiefly on the basis of the chomata, neither of the two vesicular species fits either of the two Recent genera of pycnodontine oysters, *Hyotissa* and *Neopycnodonte*, both of Stenzel, 1971. With some reservation they are referred to the genus *Pycnodonte*, although they do not fit well any of the four subgenera which Stenzel recognized therein.

Family Gryphaeidae Vyalov, 1936
Subfamily Pycnodonteinae Stenzel, 1959
Genus *Pycnodonte* Fischer de Waldheim, 1835

Pycnodonte (subgenus?) *paroxis* (Lesueur MS *in* Dockery, 1982)

1982 *Ostrea paroxis* Lesueur n.sp. (from unpublished manuscript) Dockery, Miss. Bur. Geol. Bull. 123, p. 53, pl. 17, fig. 13; pl. 59, fig. 10; pl. 60, figs. 1-3.

Chalky deposits are distinctly vesicular. The muscle scar is subcircular. For a short distance on both anterior and posterior margins below the ligament the chomata are vermiculate, and this area may be flat, or raised to varying extent as a chomatal ridge in the right valve, with comparable trough in the left; when the ridge is more prominent, the chomata become larger as they cross its crest. Chomata usually continue downward below the sub-ligamental area, often to the lower margin of the adductor muscle scar, either as the fine, branching, vermiculate type or becoming straight, evenly spaced and coarse, with deep grooves of the same width between. Possibly the latter interdigitate with comparable ones of the opposite valve, whereas when they remain finely vermiculate and flat, they probably do not; no matched valves were found.

In the Recent genus *Hyotissa,* vermiculate chomata are always present, but limited to the narrow region just below the ligament, in all five known species. Only in some larger specimens of *H. hyotis* (Linne, 1758) are large, straight chomata (lathe chomata) present, extending downward below the vermiculate ones as far as the adductor muscle, and they do not seem to interdigitate with those of the opposite valve.

Pycnodonte paroxis is probably a descendant of the upper Eocene species *Pycnodonte trigonalis* (Conrad *in* Wailes, 1854). This latter species first occurs in the Gosport Sand of the upper Claiborne Group (Dockery, 1977, p. 118, pl. 22, fig. 6-7) and continues throughout the Jackson Group. The type of this species is from the Moodys Branch Formation at Jackson, Mississippi. Specimens from this horizon are not foliated, have a moderate-sized to large, round, muscle scar, and have vermiculate chomata, which are generally restricted to the sub-ligamental area.

Pycnodonte (subgenus?) *vicksburgensis* (Conrad, 1848)

1982 *Lopha (Lopha) vicksburgensis* (Conrad), Dockery, Miss. Bur. Geol. Bull. 123, p. 53 (*q.v.* for extended literature citations); pl. 17, figs. 7-12, text fig. 34, 2 (holotype).

The adductor muscle scar is large and circular; chalk deposits are abundant and vesicular. A narrow, acute chomatal ridge in the right valve often continues well ventrad, forming the inner boundary of the commissural shelf (see Dockery, 1982, pl. 17, fig. 10a); a similar groove in the left valve is sometimes well defined (Dockery, 1982, pl. 17, fig. 12a).

Chomata are much varied in form and in their extent downward along the margin. They are always present just below the ligament, where they are coarse and irregular, not fine, as in the previous species, with usually a chomatal ridge (right valve) and trough (left valve) present there; the ones on the posterior margin being narrower and more acutely angled than those on the anterior margin. There may be no chomata below that area, or they may extend downward for a variable distance, even completely around the ventral margin; they tend to be slightly elongate, and straight or equidimensional (pustular). There are sockets in the left valve to receive the ridges or pustules of the right one, and the chomatal pattern is therefore essentially ostreine, but obviously derived from the vermiculate ones characteristic of the Pycnodonteinae.

Extensive erosion of the right valve may remove plications and obscure chomata, making some valves of this species difficult or impossible to separate from those of *P. paroxis*.

The genus *Lopha* has been used as a catch-all for any oysters having both valves plicate. That character is indeed present throughout the Recent Lophinae, with rare individual exceptions, but the group is further separated by several characters of the flesh and shell from those Pycnodonteinae which have both valves plicate. In all Lophinae the adductor muscle scar is reniform. *Lopha s.s.* should be restricted among Recent species to the type of the genus, *L. cristagalli* (Linne, 1758); Stenzel (1971) interpreted the genus too broadly, including, as ecomorphs of the type species, two species of *Dendostrea* Swainson, 1853. *Lopha s.s* does not produce chalk deposits, but forms chambers often, to smooth out the enormous troughs between plications internally.

Dall (1898, p. 682) suggested that specimens of *"Ostrea" vicksburgensis* might be young pebble-grown shells of *"Ostrea" trigonalis*. Morphological

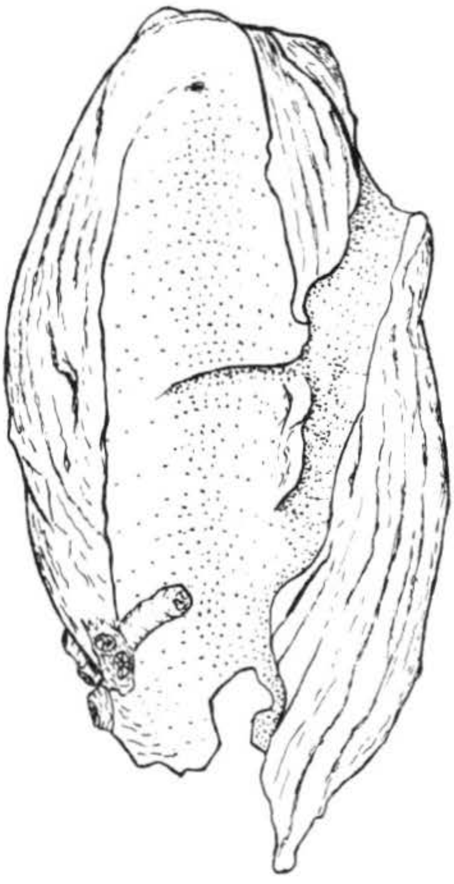


Figure 1.

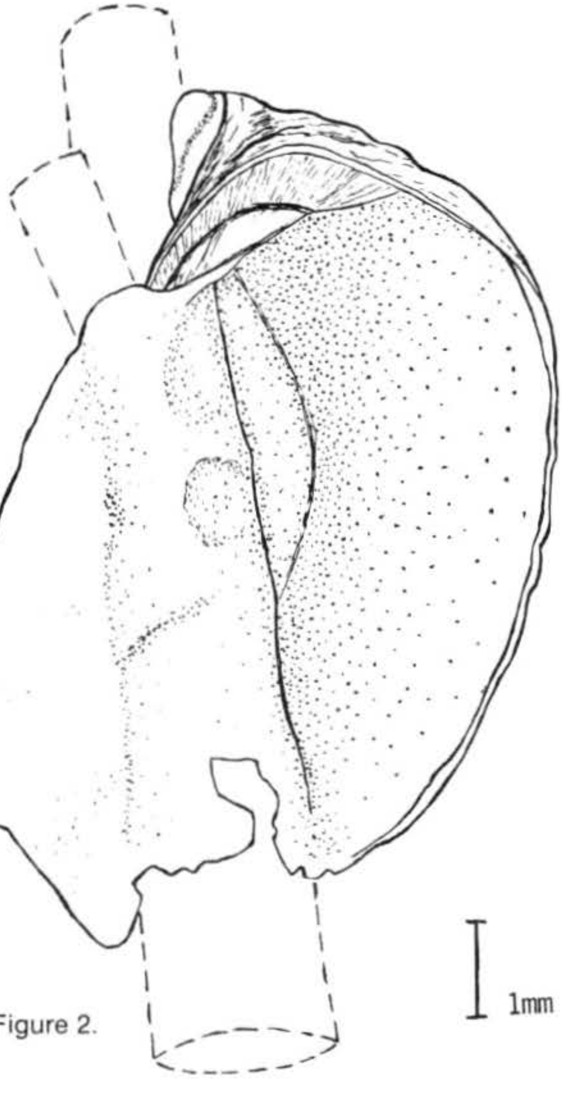


Figure 2.

Figure 3.

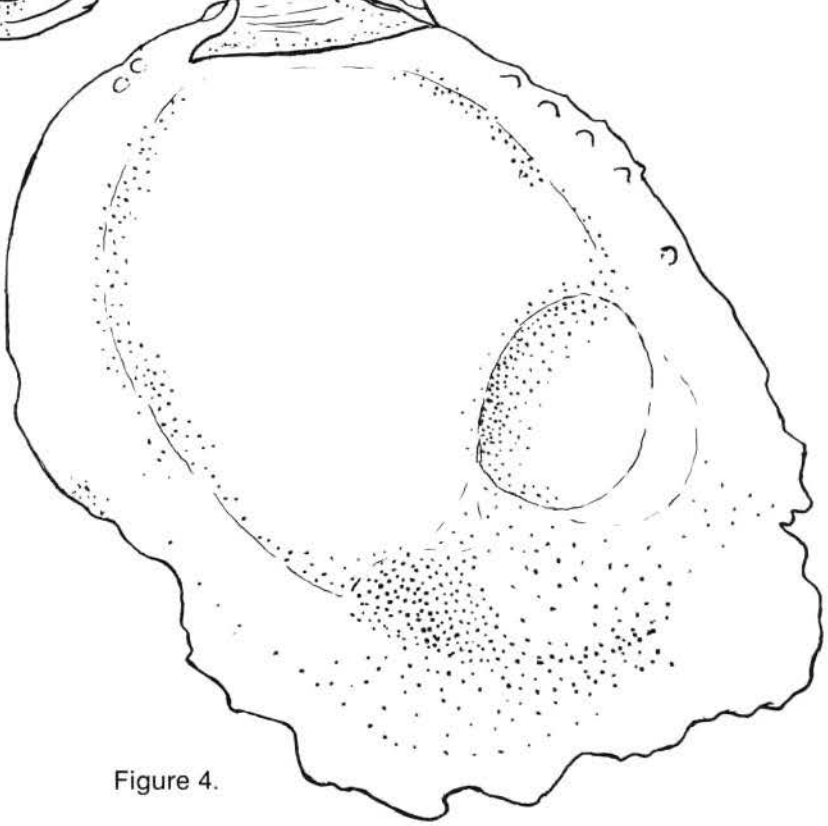


Figure 4.

differences and the absence of *Pycnodonte trigonalis* in the Vicksburg Group make this unlikely. Palmer and Brann (1965, p. 26-27) record a subspecies *P. vicksburgensis mortoni* (Gabb, 1862) from the Santee Limestone (upper Claiborne Group) in South Carolina and the Jackson Group in Alabama and also record variations of *P. vicksburgensis* in the Jackson Group in Louisiana, Mississippi and Alabama. These identifications have not been checked by the authors, but if correct would indicate that the lineages of *P. trigonalis* - *P. paroxis* and *P. vicksburgensis* parallel each other in the upper Claiborne, Jackson, and Vicksburg groups (upper Eocene - lower Oligocene). An unnamed subspecies of *P. vicksburgensis* occurs in the Chickasawhay Limestone (upper Oligocene) in Mississippi and Alabama (Dockery, 1982, p. 54).

Several very small oysters, less than 10 mm maximum dimension, were well illustrated by photographs in Dockery (1982), and all identified *Ostrea* sp. Restudy of these specimens suggests that two species are present.

Family Gryphaeidae Vylaov, 1936
Subfamily Exogyrinae Vyalov, 1936
Tribe Gryphaeostreini Stenzel, 1971
Genus *Gryphaeostrea* Conrad, 1865

Gryphaeostrea sp.

Figures 1-4

1982 *Ostrea sp.* Dockery (in part). Miss. Bur. Geol. Bull. 123, p. 53, pl. 16, figs. 9a, 9b (not figs. 7 or 10).

Single unmatched right and left valves were available, both from locality 93 of the Byram Formation. A second small right valve from locality 108 of the Mint Spring Formation may also belong to this species.

The left valve (Figs. 1,2) is thin, light tan and translucent, elongate dorso-ventrally, ovoid, deeply cupped and with a strong opisthogyrous spiraling, forming nearly one whorl. The valve was attached to some terete object where a smaller branch arose, possibly a branching coral. The ligamental area shows an anterior bourrelet and resilifer (middle of the three ligamental divisions) behind it, of subequal size, but the posterior bourrelet is essentially absent. No evidence of chomata. The interior seems to have a small, elongate deposit deep inside, opaque and possibly chalky, but no vesicles are present in it or elsewhere in the valve. The adductor muscle scar could not definitely be determined, but it seems to be in the subcircular pit, poorly defined, well shown in Dockery's photograph. The exterior of the left valve shows only growth rests, some rather prominent, with no evidence of plication.

The right valve (Figs. 3,4) is much smaller, 4.4 mm high, 4.0 mm long, oval, slightly twisted posteriad, only slightly convex, light tan and translucent; there are no plicae on it, but remnants of several slightly elevated, rather thickened, concentric lamellae are present. Internally the ligamental area was broken, so that divisions of it could not be determined. There are two distinct, pustular chomata near it on the anterior margin, and five, extending well downward, on the posterior one. A thick, smooth, translucent callus fills the upper three-fourths of the cavity; this does not seem to be a chalky deposit, but is probably of the normal foliar material of the inner shell. The muscle scar is not well defined, but appears to be a circular recession partly impinging on the lower margin of the callus.

These specimens closely resemble those illustrated by Stenzel (1971, p. N1124, fig. J98) for the genus *Gryphaeostrea*. The right valve differs in having chomata. Stenzel (1971, p. N1125) noted that the genus ranges from the Lower Cretaceous to the Miocene and it is the "only genus of the Exogyrinae to survive the end of the Cretaceous Period." He further adds, "In North America the last species, as yet undescribed, are found in the Cooper Marl (Ludian) and Marianna limestone (Rupelian) of South Carolina and Mississippi according to F. Stearns MacNeil (personal communication). These last species have radial ribs on the left valve."

The *Gryphaeostrea* sp. of the Vicksburg Group bears little resemblance to *Gryphaeostrea plicatella* (Morton, 1833), which is common in the Pachuta Marl Member of the Yazoo Formation (upper Eocene) in Mississippi and Alabama. This latter species is characterized by a well defined concentric sculpture on the exterior of the right valve formed by the termination of upturned shell lamellae (see Dockery, 1980, pl. 75, fig. 3).

Family Ostreidae Rafinesque, 1815
Subfamily Ostreinae Rafinesque, 1815
Genus *Ostrea* Linne, 1758

Ostrea sp.

Figures 5-6.

1982 *Ostrea* sp. Dockery (in part), Miss. Bur. Geol. Bull. 123, p. 53, pl. 16, figs. 7a, 7b, 10a, 10b (not 9a, 9b).

Several right valves are referred to this species. They are all small (to 8.5 mm high, 8.2 mm long), nearly flat, subtriangular, the margin forming nearly a right angle at the umbo. The ventral margin is evenly rounded, and the valve is extended slightly posteroventrally. Valves thin, light tan, translucent, the outer surface slightly irregular, with a few discontinuous growth rests as the only sculpture. The umbo is not twisted, and a prominent larval shell is still present.

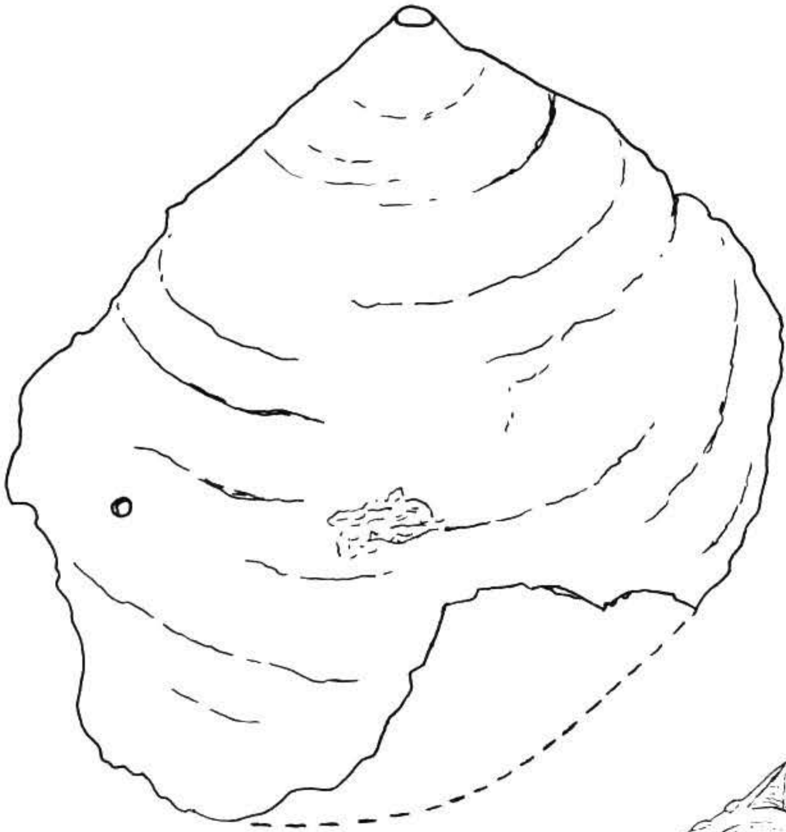
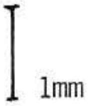


Figure 5.



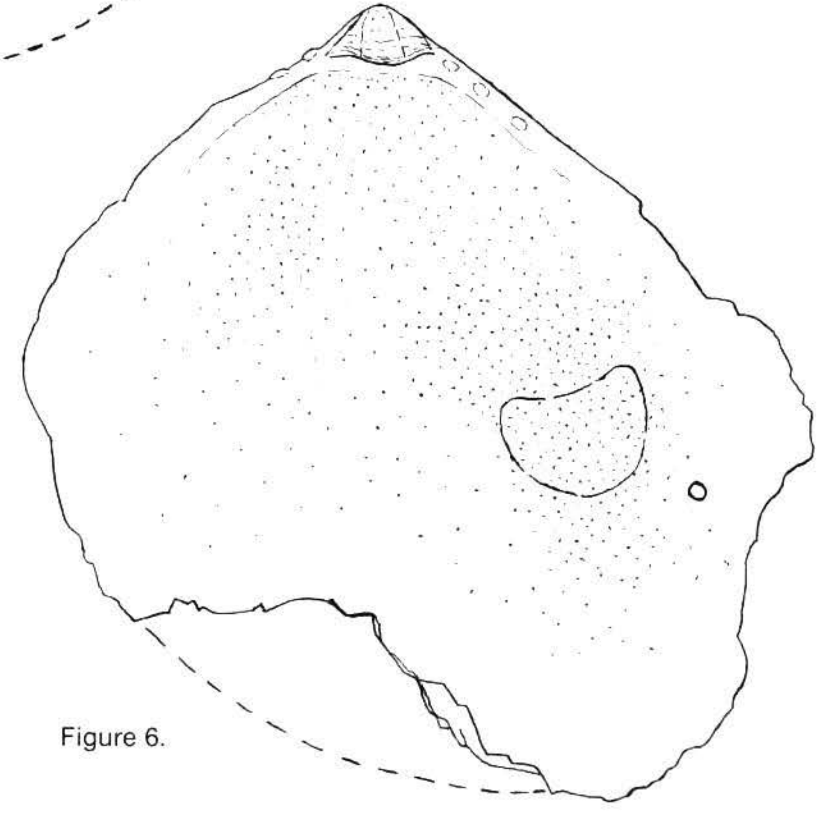


Figure 6.

There is no evidence of vesicular structure. The front and back margins have a few pustular chomata near the ligament, which is evenly tripartite. Muscle scar distinctly reniform.

This species closely resembles a Recent species, *Ostrea permollis* Sowerby, 1871, which lives from North Carolina to western Florida. It is unique among oysters in living imbedded in a sponge, for which reason Stenzel (personal communication with senior author) excluded it from the Ostreidae; it is nowhere mentioned in his book, although all characters of the shell and flesh, other than its failure to attach by the left valve, distinctly place it in the Ostreidae and near *O. edulis* Linne, 1758. The senior author has verified the anatomy of *O. permollis* from several lots of material, including specimens sent by Forbes to Stenzel, who gave them to him for examination. Through the papers by Forbes (1964,1966), *O. permollis* is one of the most thoroughly studied of any of the non-commercial oysters.

The major differences between the Oligocene specimens and *O. permollis* are the smaller size, and an oblique placement of the ligament in the Recent species, so that the front and hind margins meet the line defining the ligament at very unequal angles. The absence of encrusting and boring organisms enhances the similarity between these species. A small hole, bored probably by some predaceous snail, is on the specimen figured, below the muscle scar, and similar ones occur in the Recent species.

Superfamily Crassostreinae Torigoe, 1981
Genus *Crassostrea* Sacco, 1897

Crassostrea sp.

From the meager material available we have nothing to add to the comments given by Dockery (1982, p. 53).

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> *"An oyster has hardly any more reasoning power than a scientist has."*
>
> —Mark Twain

NECROLOGY

FRED ENDOM (1905-1983)

Fred Endom of 104 Midway Drive, Clinton, Mississippi, died October 31, 1983, after 59 days of hospitalization. He was born February 8, 1905, to a prominent Ouachita Parish, Louisiana, family.

Fred began work as a derrick builder in the Monroe Gas Field, moving to Jackson in 1928. For many years he was the only derrick contractor east of the Mississippi River; he had an enviable reputation for promptness in carrying out his contracts and fairness in working relationship with his men. Fred built the first wooden derrick in the Jackson Gas Field, the first steel derrick in the Tinsley Oil Field, constructed derricks in the Gulf of Mexico, the North Sea, the Persian Gulf, in all, in 18 foreign countries. Fred and wife, Gene, published ROBERT L. STEFFEY'S OIL SCOUT SERVICE before it was sold to C. L. Morgan, who operated the business for many years as DIXIE GEOLOGICAL SERVICE (later IRA L. RINEHART'S, now PETROLEUM INFORMATION).

He is survived by his wife and indispensible helpmate, Gene Gaskins; by brothers Edward (Ellisville) and Alfred (Homer, Louisiana), sister Pinkie Shumaker (Baton Rouge), by four grandchildren and three great grandchildren. Interment was in Cedarlawn Cemetery, Jackson, Mississippi.

Frederic F. Mellen

PETROLEUM NEWS

MISSISSIPPI OIL AND GAS STATISTICS, SECOND QUARTER 1983

Oil

	Bbls. Produced	Severance Tax	Average Price Per Bbl.
April	2,562,357	$ 4,068,383.12	$ 26.46
May	3,018,118	4,831,665.35	26.68
June	2,476,468	3,811,295.89	25.65
Totals	8,056,943	$ 12,711,344.36	$ 26.29

Gas

	MCF Produced	Severance Tax	Average Price Per MCF
April	19,316,704	$ 3,894,966.56	$ 3.36
May	23,749,930	5,498,865.99	3.86
June	16,597,063	3,931,256.48	3.95
Totals	59,663,697	$ 13,325,089.03	$ 3.72

Source: State Tax Commission

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