

# A New Pycnodont Oyster from the Pungo River Formation, and an Annotated List of the Cenozoic Pycnodonts of the Atlantic and Gulf Coastal Plain

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## ABSTRACT

*Pycnodonte (Gigantostrea) leeana*, new species, is described, and the Coastal Plain pycnodont oysters are listed with geologic and geographic ranges.

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## Introduction

The oysters with vesicular shell structure now commonly referred to as pycnodonts (Pycnodontinae) have been distinguished lately from other suprageneric taxa in the Ostreacea. The need for discrimination has been well demonstrated by the work of Ranson (1939–1941) and of Stenzel, culminating in Stenzel (1971).

Although its systematic significance may have been overlooked, vesicularity in American fossil oysters had been noted by Whitfield (1894:29) in the Miocene *Ostrea percrassa* Conrad and earlier Lamarck's *Gryphaea vesicularis* was commonly used as a name for Cretaceous and Paleocene pycnodonts, particularly in New Jersey. The vermiculate character of the chomata (denticles) is equal in importance and usually more easily observed. Gardner (1916:572) used *Pycnodonte* Fischer de Waldheim as a subgenus of *Gryphaea* for the species *vesicularis* Lamarck, which she regarded as the prior name for *radiata* Fischer de Waldheim, the type-species of *Pycnodonte*. No notice was taken of the vesicular shell structure but the vermiculate form of the denticles was described. According to Stenzel (1971:1105) prismatic shell layers are absent except in the genus *Neopycnodonte*.

Fossil pycnodonts are presently unknown in the Coastal Plain after Yorktown time, but they can be expected. *Ostrea thomasi* McLean (1941:7, pls. 3, 4) described from the western Atlantic is obviously a pycnodont. Its vesicular shell structure is well illustrated. It is a homonym of *O. thomasi*

“Conrad” Glenn (1904:380), and according to Abbott (1954:374) it is a synonym of the pycnodont *Ostrea hyotis* L. (as recognized by Ranson (1949:451)), which is a common Recent Indo-Pacific species. Ranson reported *O. hyotis* from numerous Atlantic localities. The species has not been reported in any of the standard works on Atlantic or Caribbean faunas except by Abbott (1954, 1974). Recently, Harry (1985:130) has renamed *O. thomasi* McLean as *Parahyotissa mcgintyi* and made it the type of his new genus *Parahyotissa*. Harry (1985:132–133) also reported *Neopycnodonte cochlear* (Poli) in the western Atlantic and Gulf of Mexico.

The purpose here is to describe new species of *Pycnodonte (Gigantostrea)* from the middle Miocene Pungo River Formation. Palmer and Brann (1965:149) introduced the use of *Gigantostrea* Sacco for some Coastal Plain pycnodonts. The figure of the type of the type-species of *Pycnodonte* Fischer de Waldheim, 1835 (*P. radiata* Fischer de Waldheim) is so different from that of *Gigantostrea* Sacco (*G. gigantea* (Solander) as figured by Stenzel (1971, fig. J81, 1, 2) that I am unable to follow Stenzel (1971:1107) in synonymizing *Gigantostrea* under *Pycnodonte (Pycnodonte)*.

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## *Pycnodonte (Gigantostrea) leeana*, new species

FIGURES 1–5

DESCRIPTION.—Shell large, subcircular, not excessively thickened for the size. More or less equivalved, left valve of holotype slightly larger. Convexity irregular, more pronounced anteriorly; left valve of the holotype the more convex; left valve, the larger figured paratype, irregularly flattened. Exterior concentric sculpture of irregular lamellae and occasional concentric welts; radial sculpture of faint interrupted lines and undulations. Resilifer small and high.

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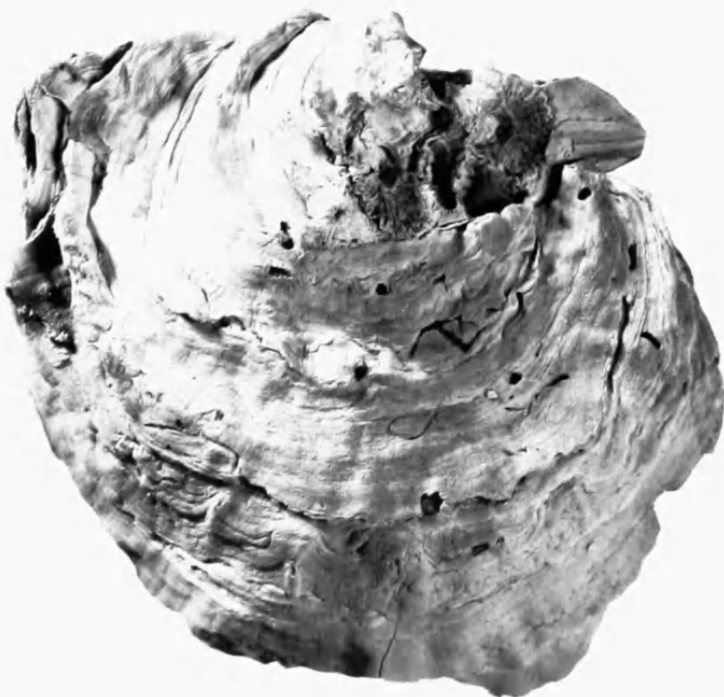
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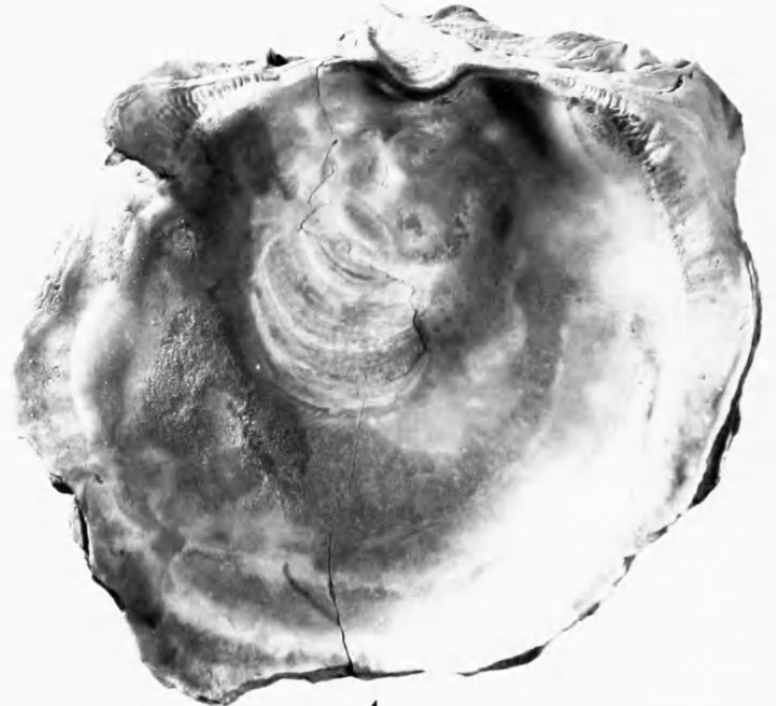
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FIGURES 1-4.—*Pycnodonte (Gigantostrea) leana*, new species, holotype, USNM 647680, height 87 mm, length 102 mm, thickness 34.4 mm; 1-2, right valve; 3-4, left valve.



FIGURE 5.—*Pycnodonte (Gigantostrea) leana*, new species, left valve, paratype, USNM 647681, height 155 mm, length 140 mm.

Adductor scar ovate and above midpoint. Chomata vermiculate and prominent.

**HOLOTYPE.**—USNM 647680 (both valves), height 87 mm, length 102 mm, thickness 34.4 mm (Figures 1–4); paratype: USNM 647681 (left valve), height 155 mm, length 140 mm (Figure 5).

All specimens are float with matrix like sediments of the Pungo River Formation.

Woodring (1982:607) considered an unnamed species from the Gatun Formation (middle Miocene) of Panama to be similar to or the same as *P. leana*.

Specimens from a float locality in Charlotte County in southern Florida collected by Muriel Hunter are very close to *P. (G.) leana*. They may be from Hunter's (1968:443) Bayshore Clay member of the Tamiami Formation said to have been named from an underwater exposure. Float

specimens of species of mollusks collected in the same general area have been identified by Hunter as species now known to belong to faunal assemblages of the Eastover Formation of Virginia. The Eastover fauna is older than Yorktown but not as old as Pungo River. At any rate the Charlotte County occurrence is the last known *Gigantostrea* in the Coastal Plain.

#### **Annotated List of Pycnodonts of the Atlantic and Gulf Coastal Plain**

There are 12 named, valid species and four unnamed species of pycnodont oysters in the Cenozoic of the Coastal Plain. Other names are synonyms, and still others are expedient uses of non-Coastal Plain species names. Palmer and Brann (1965) has been an indispensable source of



information, and the same Paleocene and Eocene species have been well figured by Toulmin (1977). Ranson (1941[1939–1941]:63–64) apparently was first to recognize several of the Coastal Plain species as pycnodonts. It is not known why Ranson (1941[1939–1941]:64) considered *O. vomer* Morton and *O. thirsae* Gabb to be pycnodonts. These species are currently allocated respectively to the genera *Gryphaeostrea* and *Odontogryphaea*, neither of which is classified as pycnodont by Stenzel (1971). Original descriptions, synonymies, and diagnoses of generic-group names are presented in detail in Stenzel (1971:1105–1114) and need not be repeated here. The Coastal Plain species are subsumed under the generic-group names listed below.

#### GENERIC-GROUP NAMES

##### *Pycnodonte* (*Phygraea*) Vyalov (1936:19)

Type: *Pycnodonte* (*Phygraea*) *pseudovesicularis* (Gümbel, 1861). According to Stenzel (1971:1107), this is the prior name for the originally designated type, *Phygraea frauscheri* Vyalov (= *Ostrea escheri* Frauscher, 1886, non Mayer-Eymar, 1876). Cretaceous-Miocene according to Stenzel (1971:1107).

##### *Pycnodonte* (*Gigantostrea*) Sacco (1897:14)

Type: *Gigantostrea gigantea* (Solander), by original designation. Lower Eocene-Miocene in the Coastal Plain.

##### *Neopycnodonte* (*Neopycnodonte*) Stenzel (1971:1109)

Type: *Neopycnodonte cochlear* (Poli), by original designation. Eocene-Recent.

##### *Neopycnodonte* (*Costellata*) Garcia and Levy (1983:283, pl. 1: figs. 1–5)

No type designated, but proposed to receive specimens from the late Tertiary of Argentina identified as *Ostrea alvarezii* d'Orbigny, 1832. The taxon may be represented by an unnamed species in the Yorktown Formation of Virginia.

##### *Hyotissa* Stenzel (1971:1107)

Type: *Hyotissa hyotis* (L.), by original designation. Upper Cretaceous-Recent, according to Stenzel.

#### SPECIFIC-GROUP NAMES

Specific names that have been applied to pycnodonts of the Coastal Plain are here listed alphabetically, with commentary. Those believed to represent valid Cenozoic species are preceded by an asterisk (\*).

##### *alabamiensis* (Lea), *Pycnodonte*

Lea, 1833:91. Ward et al. (1979:29, 31) have used Lea's name for an Eocene species from South Carolina. I have not seen Lea's holotype (monotype), but the original figure (Lea, 1833, pl. 3: fig. 71) exhibiting nonvermiculate chomata, and Harris' description (1919:8) of the type as "thin and pearlaceous," and Palmer and Brann's syn-

onymy (1965:111) seem to preclude use of the name and classification as a pycnodont. Stenzel, et al. (1957:97) have used the name as a *Crassostrea*. Presumably the South Carolina specimens are pycnodonts.

##### *antiguensis* Brown, *Ostrea*

Brown, 1913:603, 614, pl. 19: fig. 7, pl. 20: figs. 1, 5, 6. See new species, *Hyotissa* (Subgenus?)

##### \* *bryani* (Gabb), *Pycnodonte* (*Phygraea*)

Gabb, 1877:321. Paleocene (Vincentown Fm)-middle Eocene (Manasquan Fm and Shark River Fm), New Jersey. According to Palmer and Brann (1965:230) *precedens* and *glandiformis*, both of Whitfield (1885), are synonyms. *P. bryani* and *P. glandiformis* were recognized as pycnodonts by Ranson (1941[1939–1941]:63).

##### \* *dissimilaris* (Weller), *Pycnodonte* (*Phygraea*)

Weller, 1907:453, pl. 46: figs. 2, 3. Paleocene, New Jersey (Hornerstown Fm) and North Carolina (Beaufort Fm) (Wilson et al., 1972:129). Earlier writers on the New Jersey fauna used *vesicularis* Lamarck as a name for this species and Clark and Martin's figures (1901, pl. 50: figs. 6, 6a) of *vesicularis* from Maryland are the same.

##### *glandiformis* Whitfield, *Ostrea*

Whitfield, 1885:205, pl. 27: figs. 1–5. See *bryani* (Gabb).

##### \* *haitensis* (Sowerby), *Hyotissa*

Sowerby, 1850:53. Early Miocene (Chipola Fm, Florida)-late Miocene or Pliocene (Yorktown). Woodring (1982:607–610) detailed the occurrences in Tropical America and Florida. Specimens from Black Rock, Cape Fear River, North Carolina, occur with a Yorktown assemblage.

According to Olsson and Petit (1964:531) both *tamiensis* and *monroensis* of Mansfield (1932) are synonyms. They have also placed *Ostrea meridionalis* Heilprin in the synonymy of *haitensis*. *O. meridionalis* was described from the Caloosahatchee River as a part of the Caloosahatchee (Pliocene) fauna (Heilprin, 1886–1887:31, 100, 103). Dall (1898:686) placed *meridionalis* in the synonymy of *O. sculpturata* Conrad, a moderately large plicate nonpycnodont oyster. I have examined the better preserved specimen of Heilprin's two figured syntypes of *Ostrea meridionalis*; it exhibits the vesicular shell structure of pycnodonts in one small worn area of the exterior. This left valve (Heilprin, 1886 [1886–1887], pl. 14, fig. 35a) called holotype by Olsson and Harbison (1953:51, pl. 4, figs. 3, 3a) is here designated lectotype. This is in accord with Recommendation 74A of the 1985 International Code of Zoological Nomenclature (third edition). Richards (1968:65) has cited the well-preserved syntype as "type." Heilprin's specimen undoubtedly came from a facies of the Tami Fm, which underlies the Caloosahatchee Fm along the Caloosahatchee River. The fauna of this facies includes *Echphora quadricostata* (Say), *Ostrea compressirostra* Say (*O. disparilis* Conrad of authors), and *Discinisca lugubris* (Conrad), all species characteristic of beds of Yorktown age.

Although *Hyotissa haitensis* has the greatest range in time of any Coastal Plain pycnodont, it is stratigraphically useful. It is not known to occur in strata of an age later than Yorktown time, i.e., the Pinecrest Fm of southern Florida and the Jackson Bluff Fm of western Florida.

In an involved use of the names *Ostrea tamiamiensis* Mansfield and *O. tamiamiensis monroensis* Mansfield, Eppert (1966:58–59) has overlooked the fact that beds of both Tamiami and Chipola ages are present in the Sarasota area. This is reflected in his faunal lists, which are biostratigraphic faunal mixtures, treated as faunal assemblages. *Hyotissa haitensis* occurs in beds of both ages.

\**leeana*, *Pycnodonte* (*Gigantostrea*), new species

See page 13.

\**ludoviciana* (Harris), *Hyotissa* (Subgenus?)

Harris, 1919:14, pl. 10: figs. 1–10. The range may be middle Eocene (Claiborne) of Louisiana only: Palmer and Brann (1965:26) have queried the Jackson Eocene occurrence given by Harris (1946, pl. 2: fig. 7). Discrimination of the *vicksburgensis-mortoni-ludoviciana* species complex is so difficult that ranges cannot be accepted as final until the complex has been studied carefully. Ward et al. (1979:29) have listed *ludoviciana* (as *Pycnodonte*) from the middle Eocene Santee Limestone of South Carolina. Previous workers (Gabb, 1861; Harbison, 1944) have reported *mortoni* from the Santee (see *mortoni* Gabb).

*meridionalis* Heilprin, *Ostrea*

Heilprin, 1886[1886–1887]:100, pl. 14: fig. 35. See *haitensis* (Sowerby).

*monroensis* Mansfield, *Ostrea tamiamiensis*

Mansfield, 1932:46, pl. 14: fig. 2, pl. 15: figs. 1–4. See *haitensis* (Sowerby).

\**mortoni* (Gabb), *Hyotissa* (Subgenus?)

Gabb, 1861:329. This name was proposed by Gabb for specimens from the Eocene of South Carolina and from Alabama; he also referred to a specimen figured by Morton (1834, pl. 19: fig. 10) as *Ostrea*, “var. from Alab.” This specimen was regarded as “Gabb’s type” by Harris (1946, pl. 1: fig. 15) and Palmer and Brann (1965:27), but Richards (1968:67) has considered the “types” to be from South Carolina. The Alabama occurrence is listed as “Eocene probably upper” by Palmer and Brann. If the species occurs in South Carolina, it is probably in the middle Eocene Santee Limestone. In the absence of specimens or figures of specimens from South Carolina, it is not possible to make decisions. Harbison’s figured fragment (1944, pl. 3: fig. 5) is too poor to be definitive. The species was recognized as a pycnodont by Ranson (1941[1939–1941]:64).

*panda* Morton, *Ostrea*

Morton, 1834:51, pl. 3: fig. 6, pl. 19: fig. 10. According to Palmer and Brann (1965:26) this name has been used for specimens of *Hyotissa* (Subgenus?) *mortoni* (Gabb). It is a valid Cretaceous species.

*pandaeformis* Gabb, *Ostrea*

Gabb, 1861:328. See *trigonalis* (Conrad).

\**paroxis* (Dockery), *Hyotissa*?

Dockery, 1982:53, pl. 17: fig. 13, pl. 59: fig. 10, pl. 60: figs. 1–3. Oligocene Vicksburg group of Mississippi. Dockery has documented the source of the name as Leseur’s unpublished manuscript. The description and type material are Dockery’s. The pycnodont characters have been described by Harry and Dockery (1983:9). A species of pycnodont common in the Oligocene of the Superior Stone Co. quarry, New Bern, North Carolina, probably belongs to this species.

\**percrassa* (Conrad), *Hyotissa*

Conrad, 1840:50, pl. 25: fig. 1. Middle Miocene, Maryland (Calvert Fm) and New Jersey (Kirkwood Fm). Palmer and Brann (1965:149) have noted Dall’s misuse (1898:683) of the name for Eocene oysters. The vesicular structure of the species was noted as early as 1894 by Whitfield (1894:29). Ranson (1941[1939–1941]:64) recognized it as a pycnodont.

\**podagrina* (Dall), *Hyotissa*

Dall, 1896:22; 1898, pl. 30: figs. 5, 6. Upper Eocene (“Ocala Fm”), Florida. Palmer and Brann (1965:236) have documented the Eocene as determined by Foraminifera associated with the type-specimen; and that the “Oligocene” of Dall (1898, pl. 30: figs. 5, 6) and the Miocene (“Chipola Formation”) of Gardner (1926:42, pl. 10: figs. 5, 6) are erroneously applied to the type-specimen. Recognized as a pycnodont by Ranson (1941[1939–1941]:64). See new species, *Hyotissa* (Subgenus?), for records of erroneous usages.

*precedens* Whitfield, *Gryphaea bryani*, var.

Whitfield, 1885:194, pl. 26: figs. 7, 8. See *bryani* (Gabb).

*queteleti* Nyst, *Ostrea*

See new species, *Pycnodonte* (*Phygraea*). I have had no success in finding the original reference of “*Ostrea queteleti* Nyst 1853” of authors, a European species.

\**sylvaerupis* (Harris), *Pycnodonte* (*Gigantostrea*)

Harris, 1897:230, pls. 4, 5, pl. 6: figs. 3, 3a, 4. Lower Eocene (Sabine), Alabama and Louisiana, according to Palmer and Brann (1965:149).

*tamiamiensis* Mansfield, *Ostrea*

Mansfield, 1932:46, pl. 14: figs. 1, 3. See *haitensis* (Sowerby).

\**trigonalis* (Conrad), *Pycnodonte* (*Gigantostrea*)

Conrad, 1854:289, pl. 14: fig. 10 (reprinted 1939:359, pl. 23: fig. 10). Upper Eocene (Jackson), Mississippi and Alabama. Jackson age established by Harris (1946:21–24). Perhaps no pycnodont species name has been so widely used and misused. Glenn (1904:381, pl. 101, figs. 1a, 1b) used the name for a form of *percrassa*. Lately Harry and Dockery (1983:9) have extended the range downward into “the Gosport Sand of the upper Claiborne Group,” by reidentifying forms earlier figured by Dockery (1977:118, pl. 22: figs. 6a, 6b, 7) as a “variation” of *P. trigonalis*. Kellum (1926:17) and Cooke and MacNeil

(1952:25) used the name for a nonpyncodont species from a bed at Pollocksville, North Carolina, now known to be Oligocene in age. According to Palmer and Brann (1965:149) *pandaeformis* (Gabb, 1861) and *tuomeyi* (Conrad, 1865) are synonyms of *trigonalis*. Cooke's *trigonalis* (1926, pl. 96: fig. 3) apparently is *P. podagrina* (Dall). Palmer and Brann (1965:150) have documented the misuse of the name for Miocene species by various authors. *P. trigonalis* was recognized as a pyncodont by Ranson (1941[1939–1941]:64).

*tuomeyi* Conrad, *Ostrea*

Conrad, 1865:184. See *trigonalis* (Conrad).

*vesicularis* Lamarck, *Gryphaea*

Lamarck, 1806:160. See *dissimularis* (Weller).

\**vicksburgensis* (Conrad), *Hyotissa* (Subgenus?)

Conrad, 1847:296. Palmer and Brann (1965:27) have characterized as "*vicksburgensis* variations" published Eocene occurrences of this species, thus effectively limiting the name to Oligocene occurrences. The species has been reported in the Oligocene of Alabama, Arkansas, Georgia, and Louisiana, as well as its type occurrence at Vicksburg, Mississippi; also Oligocene of Mexico (Gardner, 1945:83). The species was recognized as a pyncodont by Ranson (1941[1939–1941]:64).

#### UNNAMED SPECIES

new species, *Hyotissa* (Subgenus?)

Lower Miocene (Edisto Fm), Edisto River, South Carolina. Sloan's (1908:470–472) "Edisto Phase" [not "Marl"]

has been resurrected by Ward et al. (1979:26) as the Edisto Formation. Sloan (1908:471) noted this species as "*Ostrea haitiensis*"; Cooke (1936:86) and later Cooke and MacNeil (1952:26) called it *podagrina*. MacNeil (in Malde, 1959:26, 27) referred to it as *Ostrea* sp. aff.? *O. antiguensis* Brown, saying that it belonged to the *panda-podagrina-vicksburgensis* group. This is not the same as the small or poorly preserved specimens identified by Mansfield (1937:204) as *Ostrea* aff. *O. antiguensis* from the Oligocene of Florida nor as *Ostrea* sp. cf. *O. antiguensis* from the Oligocene of Mississippi (Mansfield 1940:187).

new species, *Neopyncodonte*

Lower Eocene (Tusahoma Formation), Marengo County, Alabama (USGS 15194 and 15478). Identified by Harold Harry.

new species, *Neopyncodonte* (*Costellata*)

An undescribed species in the Yorktown Formation of Virginia and at Lee Creek, North Carolina, apparently belongs to *Costellata* Garcia and Levy, described from the late Tertiary of Argentina. This new species may or may not be the same as the *Pyncodonte* sp. figured by Ward and Blackwelder (1980, pl. 4: figs. 3, 4) and Blackwelder (1981, pl. 1: fig. 8).

new species, *Pyncodonte* (*Phygraea*)

Oligocene (Cooper Marl), South Carolina. Identified as "*O. n. sp. aff. O. queteleti* Nyst" by MacNeil (in Malde, 1959:15, 20) a pyncodont widespread in the Oligocene of Europe. This is the last occurrence in the Coastal Plain of the lineage of species with incised radiate lines on the right valve.

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