5/2

To Dr. Paul Bartsch
With compliments of
Katherine V. W. Pal

BULLETINS

OF

AMERICAN PALEONTOLOGY

VOL. VII

No. 32

(In Two Parts)

PART I. TEXT

1937

Paleontological Research Institution

Ithaca, New York

BULLETINS

OF

AMERICAN PALEONTOLOGY

VOL. VII

No. 32

The Claibornian Scaphopoda, Gastropoda and Dibranchiate Cephalopoda of the Southern United States

Katherine Van Winkle Palmer, Ph. D.

PART I. TEXT

December 20, 1937

Ithaca, New York

CONTENTS OF VOLUME VII (Bull. No. 32)

The Claibornian Scaphopoda, Gastropoda and Dibranchiate Cephalopoda of the Southern United States.

Part I : Text, pp 1 - 548. Part II : Plates 1 - 90 and pp. 549 - 730

By Katherine Van Winkle Palmer

CLAIBORNE BLUFF, ALABAMA

(See page 6)

PREFACE

It has long been the aim of Prof. G. D. Harris to have successive, thoroughly illustrated monographs of the molluscan fauna of the southern and eastern Tertiaries of the United States. Toward this end he inaugurated in 1895, the Bulletins of American Paleontology. Prof. Harris had completed the work of four monographs by 1919, bringing the series from the work on the Midway, basal Eocene through the study of the pelecypods of the Clai-bornian Eocene. The remaining mollusca of the Claibornian of the southern area of the United States were turned over to the writer and volume VII, number 32 of the Bulletins of American Paleontology was reserved for the report. Prof. Harris retained the shells of the family Turridæ for his personal study. That work has been published in Paleontographica Americana, vol. II, No. 7, "Turrid Illustrations", 1937.

One hundred and five years ago, T. A. Conrad described the first mollusk species[1] of the southern Eocene from Claiborne Bluff, Ala. Conrad continued describing the shells from the ferruginous sand mainly in his private publications, in the publications of the Academy of Natural Sciences, American Journal of Conchology and in Silliman's Journal. Isaac Lea[2] contemporaneously published descriptions of the Claiborne shells. In many cases, Conrad and Lea were describing the same species, hence the complicated synonymy did much to retard the knowledge of the famous Claiborne fossils. Although Lea's descriptions are mainly better and his species more fully illustrated, Conrad has priority in date. Fortunately, the type collections of each are intact in the Academy of Natural Sciences at Philadelphia, Pa. Harris's[3] catalogue of the Conrad and Lea names helped after 1895 to reduce the complications. Harris, also in 1895, catalogued the Lea

[1]Conrad, T. A., Fossil Sh. Tert. Form., vol. 1, No. 1, 20 pp., 6 pls., Oct. 1, 1832.
[2]Lea, I., Cont. to Geol., 227 pp., 6 pls., 1833.
[3]Harris, G. D., Bull. Amer. Pal., vol. 1, No. 1, 52 pp., 1 pl., 1895.

Claibornian collection at the Academy of Natural Sciences. In 1893, he had ventured the republication of the complete numbers of the Fossil Shells. This in itself was an inestimable service rendered to Tertiary Paleontology.

Prior to that time H. C. Lea, A. Heilprin, T. H. Aldrich and O. Meyer described additional species from the "sand". Aldrich and Meyer's greater contribution was the collection, description and illustration of species from the sediments which lie below the ferruginous sand (Gosport sand) at Claiborne Bluff and which are widely distributed away from there and occur at such places as Lisbon, Alabama; Newton, Wautubbee and Hickory, Mississippi. Outstanding in the Aldrich and Meyer collections are unique species and small forms which escape the eye of the ordinary collector. Aldrich continued adding to the knowledge of the southern Eocene Molluscan faunas until his death in 1932.

W. M. Gabb[4] was the first to describe species in the Texas Claibornian strata which are older than those from the Gosport sand. Gabb's species are poorly illustrated and by themselves would be useless for identification. Heilprin worked on Gabb's material and published a few new species. G. D. Harris when with the State Geological Survey of Texas, in 1893 completed a fine monograph, excellently illustrated with drawings by himself and Dr. McConnell of Washington, D. C., of the Eocene of the Gulf, particularly Texas. Funds were withdrawn before its publication. The failure to publish that work was another factor in retarding the progress of the delineation of the Eocene paleontology of the Gulf region. Prof. Harris published the new species in the Proceedings of the Academy of Natural Sciences[5].

The writer has consulted freely the Texas MS. and some of the drawings made by Harris for that paper are reproduced herein.

C. W. Johnson[6] and T. W. Vaughan[7] and W. H. Dall[8] added a few new species.

[4]Gabb, W. M., Acad. Nat. Sci., Jour. 2d. ser., vol. IV, pp. 375-402, pl. 67-69. 1860.

[5]Harris, G. D., Acad. Nat. Sci. Phila. Proc. vol. 47, pp. 45-88, pls. 1-9, 1895.

[6]Johnson, C. W., Acad. Nat. Sci. Phila., vol. 51, pp. 71-81, pls. I, II, 1899.

[7]Vaughan, T. W., U. S. Geol. Sur., vol. 142, 65 pp., 4 pls., 1896.

[8]Dall, W. H., Trans. Wag. Free Inst. Sci. Phila., vol. 3, pts. 1-11, 473 pp., 22 pls., 1890-1892.

The fame of the "sand" at Claiborne spread abroad, where barrels of the material were shipped to scientists and collectors. Marquis Antoine de Gregorio[9], in Palermo, Sicily published a large, quarto monograph on the Eocene fauna of Alabama from such sources. De Gregorio did a great service by bringing together the literature and illustrations of the Eocene of Alabama. He frequently confused the age of the horizons and in the writer's estimation overnamed species. Many of the specimens represented by his numerous names are merely different stages of growth in the same species. There is the possibility that his collections may have become mixed and some of the species described as from Claiborne may be extraneous.

Maurice Cossmann[10] further contributed descriptions of new species from the Gosport sand. Cossmann[11] throughout his Essais de Paléoconchologie Comparée gives generic classification to the American species. His age determination of the American stratigraphy must be taken with caution, as the localities and age are often erroneous.

The aim of this paper is not so much to describe great numbers of new material which obviously will be uncovered in the lower Claiborne localities of the Gulf states, particularly Texas and Louisiana as it is to elucidate the as yet obscurely known old forms and to make a foundation so that future investigations may be accelerated. There will undoubtedly be a greater wealth of new material yet to be described. To this end Drs. Julia Gardner, H. B. Stenzel and F. B. Plummer are making valuable contributions.

The study of the fauna as involved in this report is worked toward the history of the Claibornian Eocene embayment as a whole. For this reason, local formational names are not applied as used in the separate states of Alabama, Mississippi, Louisiana and Texas. Because the problem of the Claibornian stratigraphy as a unit has not been satisfactorily worked out as yet, the general term lower Claiborne is used for that time from the Sabine (Wilcox) to the Gosport sand.

[9]de Gregorio, A., Ann. de Géologie et de Paléontologie, 7 et 8 liv., 316 pp., 46 pls., 1890.

[10]Cossmann, M., Ann. de Geol. et de Pal., 12 liv., pp. -51. 2 pls., 1893.

[11]Cossmann, M., Essais de Pal. Comparée, 1-13 liv., 1895-1925.

The present volume consists of factual material of species description and illustration. Such is the primary factor upon which the faunal and stratigraphic generalizations are made. The extensive size of this volume prevents addition of further material. The general analyses of the fossils, diagnoses as to local areas and formations, lists and comparisons of the fauna as a whole will be worked up and published separately.

The extensive material with which this study was made belongs mainly to G. D. Harris and is in the Paleontological Research Institution, Ithaca, N. Y. The collections from the Gosport sand, at Claiborne Bluff, Ala. were the result of 6 trips over a period of 42 years by Harris, one by the writer in January, 1935 and the last by G. D. Harris, R. H. Flower and the author in 1936 under the auspices of the Paleontological Research Institution.

Most of the large collections from the lower Claiborne localities of Texas, Louisiana, Mississippi, Alabama and South Carolina was accumulated during the 10 years of field work of G. D. Harris and A. C. Veatch. A. A. Olsson collected material in Mississippi. John W. Wells and W. Armstrong Price sent material from Texas. Special acknowledgement is due John E. Adams for a fine collection from Texas.

G. D. Harris, R. Flower and the writer collected at old and new localities of the Eocene and Oligocene of Mississippi, Eocene of Alabama and South Carolina.

The most available detailed section of the Bluff at Claiborne, Ala., is that published by C. W. Cooke[12], adapted from the work of E. A. Smith and others and included recently by J. B. Garrett, Jr.[13] in the Journal of Paleontology.

H. E. Wheeler[14] has given a great many details concerning the history of Claiborne and the early fossil collecting there in, "Timothy Abbott Conrad, with Particular Reference to his work in Alabama One Hundred Years Ago". Plate 17, of that volume, is through the kind permission of Mr. Wheeler included herein as the frontispiece.

[12]Cooke, C. W., Geol. Sur. Ala., Special Rept. No. 14, p. 271, 1926.
[13]Garrett, J. B. Jr., Jour. Pal., vol. 10, No. 8, p. 785, 1936.
[14]Wheeler, H. E., Bull. Amer. Pal., vol. XXIII, No. 77, pp. 157, 27 pls., 1935.

Funds comprising two grants from the Hecksher Research Foundation at Cornell University were contributed toward the early work of this monograph. Thanks are given to that Foundation.

Special effort has been made to study the type material of as many of the Claibornian species as are available. To this end, members of the staffs at the various Institutions where types are deposited have all been most gracious and helpful. Appreciation is expressed to André Chavan, of Nanterre (Seine), France; Arthur W. Wrigley, of Norbury, England; Prof. A. Peyrot, Bordeaux, France; Prof. Dott. R. Fabiani, Università di Palermo and Rosa de Gregorio of Palermo, Sicily; Dr. Paul Bartsch and Dr. W. C. Mansfield, of the U. S. National Museum; Dr. H. A. Pilsbry of the Academy of Natural Sciences of Philadelphia; Dr. E. W. Berry, Johns Hopkins University; Dr. Chester Reeds of the American Museum of Natural History; A. W. Slocum and Dr. Carey Croneis of the Walker Museum, University of Chicago; Dr. F. L. Whitney, University of Texas; Miss Winnie McGlamery of Alabama Museum of Natural History; Mr. H. E. Wheeler, Birmingham, Ala., and Dr. John W. Wells, Paleontological Research Institution.

The late T. H. Aldrich was responsible for a collection of excellent drawings of the Conrad, Lea (I. and H. C.) and Gabb types by Otto Meyer. Mr. Aldrich turned the drawings over to the writer in 1928. Many of the Meyer drawings are reproduced in this report, plates 78-90. The value of the drawings to the author during the execution of this work and to Eocene workers in general, cannot be estimated. Without such, the study could not have been made away from the type collections. By their reproduction, many of the problems which have arisen through the inadequate illustrations of Conrad, Leas (father and son) and Gabb will be solved. The illustration of a few southern Eocene types at the Academy of Natural Sciences had never been made. Through the efforts of Miss Helen Winchester of the Academy staff, pictures of those types are here included.

The term lectotype has been used in designating types of Conrad and Lea unless the specimen is a monotype. Comparison of Conrad's type material with his illustrations shows that many of his figures were composites and idealized. Prof. Harris' selected and catalogued the Isaac Lea types.

Besides the indispensable, available, volumes in the library, Mr. E. R. B. Willis and his staff of the Cornell University Library have been gracious and helpful in borrowing needed books.

To my husband, Dr. E. L. Palmer, I am indebted for reading the manuscript.

The greatest appreciation and thanks are due Prof. G. D. Harris, at whose suggestion the work was begun and who has waited with ever ready aid and patience for its completion.

Had it not been for the fortunate establishment of the Paleontological Research Institution whereby laboratory facilities were provided the execution of this report would have undergone an extended delay and certainly could not have been fulfilled at this time. The author further expresses her gratitude to that Institution and its founder, G. D. Harris.

Paleontological Research Institution.

May 21, 1937.

SYNONYMY REFERENCES

The specific references which are repeated most frequently, are given in the synonymy by date following the author's name. The complete reference is given in the following list to which the reader will refer by author and date.

1832. Conrad, Timothy A., Fossil Shells of the Tertiary Formations of North America, vol. 1, No. 1, Oct. 1, 20 pps., 6 pls.; vol. 1, No. 2, pp. 21-28, pls. 7-14, Dec. [Harris Reprint, 1893][15].

1833. Conrad, ibid, vol. 1, No. 3, pp. 29-38. Sept. 3; vol. 1, No. 4, pp. 39-46, Nov. 26, [Harris Reprint, 1893].

1833. Lea, Isaac Contributions to Geology, 227 pp., 6 pls., Dec. 10[16].

1834. Conrad, Timothy A., Catalogue of the Fossil Shells of the Tertiary Formations of the United States in Appendix to S. G. Morton's Synopsis of the Organic Remains of the Cretaceous Group of the United States, 8 pp.

1835. Conrad, Timothy A., Fossil Shells of the Tertiary Formations of North America [Republished with Plates], vol. 1, No. 3, pp. 29-56, pls. 15-18, Mar. 1, [Harris Reprint, 1893].

1848. Lea, Henry C., Catalogue of the Tertiary Testacea of the United States, Proc. Acad. Nat. Sci. Phila., vol. IV, pp. 95-107.

1850. d'Orbigny, Alcide, Prodrome de Paléontologie etc., 25 étage, pp. 338-374, Jan.

1865. Conrad, Timothy A., Catalogue of the Eocene and Oligocene Testacea of the United States. Amer. Jour. Conch., vol. 1, No. 1, pp. 1-35.

1866. Conrad, Timothy A., Check list of the Invertebrate Fossils of North America. Eocene and Oligocene. Smith. Misc. Coll., vol. VII, No. 200, pp. 1-41.

1890. de Gregorio, Marquis Antoine, Monographie de la Faune Eocénique de l'Alabama, Ann. de Geol. et de Pal., 7 liv. pp. 1-156, pls. 1-17 *January;* 8 liv. pp. 157-316, pl. 18-46 *April.*

1890. Dall, William H., Tertiary Mollusks of Florida, Trans. Wag. Free Inst. Sci. Phila., vol. 3, pt. I, 200 pp., 12 pls., August.

1891. Heilprin Angelo, The Eocene Mollusca of the State of Texas, Acad. Nat. Sci. Phila., Proc. for 1890, vol. 42, pp. 393-406, pl. XI. [Recorded date, January].

1892. Dall, William H., ibid, vol. 3, pt. II, pp. 201-473, pls. 13-22, December.

1893. Cossmann, Maurice, Notes Complémentaires sur la Faune Eocénique de l'Alabama, Ann. de Geol. et de Pal., 12 liv., pp. 1-51, pls. I, II, April.

1895. Harris, Gilbert D., Claiborne Fossils, Bull. Amer. Pal., vol. 1, No. 1, pp. 1-50, pl. 1, May.

Generic references are given by author, date and page. The complete reference will be found in the bibliography following the description of species.

[15]Harris, G. D. Harris Reprint, Conrad's Fossil Shells, etc., pp. 6-7, 1893 gives probable true date of publication of separate parts.

[16]Harris, G. D., ibid, p. 6, 1893. True date of publication. Also given in Wheeler, H. E., Bull. Amer. Pal. vol. XXIII, No. 77, p. 103, 1935.

LOCALITY LIST

The localities of species occurrence are referred to in the text by number. The numbers with data are from the locality book of the Paleontological Research Institution. The description of the localities is given in the following list. The age of the localities is lower Claibornian Eocene unless stated otherwise. The material used in the report from the following localities unless otherwise stated was collected by G. D. Harris.

22. Marble Quarry, Winnfield, Winn Parish, La.
23. On the road 3 miles S. W. of the town of Natchitoches, Natchitoches Parish, La.
24. St. Maurice, Winn Parish, La.
103. Lower bed at the base of the bluff, on the Alabama River at Claiborne, Monroe County, Ala. Also 139.
104. "Ferruginous sand" bed at Claiborne, on the Alabama River, Monroe County, Ala. Gosport sand. Also 140.
136. Orangeburg district, Orangeburg County, S. C.
137. La Side, 200 yds. below mouth of the Bayou Negreet, La.
138. Louisiana. Exact data lost.
707. About 3 miles W. N. W. of Orangeburg, S. C.
708. About 6 miles W. N. W. of Orangeburg, S. C.
723. Moseley's Ferry, on the Brazos River, Burleson County, Texas.
724. Columbus, Sabine County, La. Collected by A. C. Veatch.
725. Sabine River, Texas side, opposite S. W. corner of S. E. ¼ Sec. 35, T. 5 N., R. 13 W., Field No. 21. Collected by A. C. Veatch.
726. Indian Mound, 3 miles east of Newton, on the A. and V. R. R., Miss. A. A. Olsson, collector.
727. Little Brazos River, 2½ miles above Stone City, Brazos County, Texas. J. E. Adams, collector.
728. Hickory, Newton County, Miss.
729. About 8 miles west of Enterprise, Clarke County, Miss.
730. Hammett's Branch, S. W. ¼ Sec. 30, T. 18 N., R. 6W, about 2 miles northeast of Mt. Lebanon, La.
731. Wautubbee, Clarke County, Miss.
732. About 1 mile southeast of Robbins, Leon County, Texas. J. E. Adams, collector.
733. Smithville, Bastrop County, Texas.
734. Lisbon, Alabama River, Monroe County, Ala.
735. Monroe, Ouachita Parish, La.
741. East bank Ouachita River, Lapiniere Landing, La. Collected by A. C. Veatch.
743. Fisher, Sabine Parish, La.
745. Near top of south side of Angelina River, bank at Marion, on the north line of Angelina County, Texas. C. L. Baker, collector.
746. About 6 miles northwest of Wheelock, Robertson County, Texas.
747. Well at Monroe, Ouachita Parish, La. Collected by Dr. Wm. C. Stubbs, 1900.
748. About 2 miles south of Hickory, Newton County, Miss.
749. Woods Bluff, Tombigbee River, Ala. Sabine Eocene.
750. Five Miles north of Orangeburg, S. C.

751. Gregg's Landing, Alabama River, Ala. Sabine Eocene.
752. Bell's Landing, Alabama River, Ala. Sabine Eocene.
753. Four miles above Hamilton Bluff, Alabama River, Ala. Sabine Eocene.
754. About 5 miles northeast of Laredo, Webb County, Texas.
755. Wautubbee cut, 6 miles south of Enterprise, Clarke County, Miss. A. A. Olsson, collector.
756. Brewer's, 1200 ft., Monroe, Ouachita Parish, La.
757. Same as 753. A. C. Veatch and Caine collectors.
758. H. W. Berryman Place 2½ miles from Linwood, 11 miles from Rusk, Angelina County, Texas. A. C. Veatch, collector.
759. Marble Quarry, Winn Parish, La. (Same as 22).
760. Vivian, Caddo Parish, La.
761. Angelina River, 2 miles above Marion, Angelina County, Texas.
762. Moore's Place, Bayou Toro, Sabine Parish, La. A. C. Veatch, collector.
763. About 5½ miles east of Nacogdoches, Nacogdoches County, Texas.
764. Rocky Landing, on Neuse River, N. C.
765. Texas side about opposite middle line of S. E. ¼ Sec. 35, T. 5 W. R. 13 N. Outcrop 22. A. C. Veatch, collector.
766. Big branch of Cedar Creek, east of Mr. Pollard's (deceased) farm, 3 miles N. W. of Stone City, Burleson County, Texas. John W. Wells, collector.
767. South bank of the Colorado River about 200 yards west of bridge, at Smithville, Bastrop County, Texas. John W. Wells, collector.
768. About 5 miles north of Fort Jessup, Sabine County, La.
770. Newton, Newton County, Miss.
771. Mount Lebanon, Bienville Parish, La.
772. Same as 730.
773. About 3 miles east of Newton, Newton County, Miss.
774. About 2½ miles east of Newton, Newton County, Miss.
775. About 10 miles northwest of Winnfield, Winn Parish, La.
776. East bank of the mouth of Gazley Creek, south side of the Colorado River, Smithville, Bastrop County, Texas. Collected by W. Armstrong Price.
778. Lisbon Landing on west bank of Alabama River about 6½ miles above a toll bridge at Claiborne, Monroe County, Ala. Collected by G. D. Harris, R. Flower, and K. Palmer.
782. Ferruginous sand bed, Gosport sand, at Claiborne Bluff, at lower landing, on both sides of old incline, Alabama River, Monroe County, Alabama. Collected by G. D. Harris, R. Flower and K. Palmer.
783. Red Bluff, Mississippi. Oligocene. A. A. Olsson, collector.
798. Red Bluff, which is at the station Hiwanee, on Mobile and Ohio R. R., on route highway 45, Mississippi. Collected by G. D. Harris, R. Flower, and K. Palmer.
803. Two miles northeast of Newton, on route 15, Mississippi. G. D. Harris, collector.
831. Smithville, Bastrop County, Texas. J. E. Adams, collector.
832. Shells from well, 40 feet deep in village, Mt. Lebanon, Bienville Parish, La.
833. Ozark, Ala.
840. Roberta, La.
843. Newcastle, Virginia. G. D. Harris and students, 1897.
864. Three miles S. W. of Thomasville, Ala. Sabine Eocene.
865. Hatchetigbee, Alabama. Sabine Eocene.

DESCRIPTION OF SPECIES

Class SCAPHOPODA

Family DENTALIIDÆ

Genus DENTALIUM[17] Linné, 1758[18]

Genotype by subsequent designation, Montfort[19], 1810, *Dentalium elephantinum* Linné. Living. Amboyna and Philippine Islands.

Subgenus ANTALIS H. and A. Adams, 1854[20]

Genotype by subsequent designation, Pilsbry and Sharp, 1897, *Dentalium entalis* Linn. Recent. Atlantic coast of Europe. Variety *stimpsoni* Henderson[21]. Nova Scotia to Cape Hatteras.

Dentalium (Antalis) thalloides Conrad Plate 1, figs. 16, 18-26

Dentalium thalloides Conrad, 1833, Sept., p. 34, non pl. 18, fig. 10; Conrad, 1834, App. in Morton, p. 8; Conrad, 1835, p. 39, pl. 15, fig. 10; Conrad, 1846, Amer. Jr. Sci., vol. 1, 2d. ser., p. 211, pl. 2, fig. 2; d'Orbigny, 1850, p. 373; Conrad, 1865, p. 34; Conrad, 1866, p. 10; de Gregorio, 1890, p. 171, pl. 17, figs. 15-18, 21a, 21b; Cossmann, 1893, p. 19; Harris, 1895, p. 45.

Dentalium alternatum Lea, 1833, Dec., p. 34, pl. 1, fig. 2; H. C. Lea, 1848, p. 99; Harris, 1895, p. 4 [synonym *D. thalloides* Conrad].

Dentalium thalloides H. C. Lea, 1848, 99; Dall, 1892, p. 438 [partim]; Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 218.

Dentalium asgum de Gregorio, 1890, p. 171, pl. 17, figs. 22-24; var. *tirpum* de Gregorio, 1890, p. 172, pl. 17, figs. 25a, b.

Dentalium bimixtum de Gregorio, 1890, p. 172, pl. 17, figs. 32-34.

Shell elongated, slightly curved, with nine distinct longitudinal costæ, and intermediate smaller ones, the latter generally three in number; the middle one being the largest. Length 2 inches.

Locality, Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Elongated, slightly curved, with prominent longitudinal costæ, alternated in size, or of three different sizes.

Syn. D. alternatum, *Lea, Con.* p. 34, *pl.* 1, *f.* 2.

Locality, Claiborne, Alab. —[Conrad, 1835].

This species is the largest *Dentalium* of the middle Eocene of the Gulf states. It is abundant in the Gosport sand and in the

[17]Summary of Opinion Rendered, No. 94, International Rules of Zoological Nomenclature, Smith. Misc. Coll., vol. 73, No. 4, p. 12, *Dentalium* L., type *D. elephantinum* L., placed in the Official List of Generic Names.

[18]Linné, C., 1758, p. 785.

[19]Montfort, D., 1810, p. 23. [This designation has priority over Gray, 1847 which is given by authors].

[20]Adams, Henry and Arthur, 1854, p. 457. For discussion of *Antalis* see Pilsbry and Sharp, Man. Conch., vol. XVII, p. 37, 1897-98.
(*Entalis* Gray, 1847; *Entaliopsis* Newton and Harris, 1894).

[21]Henderson, John B., U. S. Nat. Mus., Bull. 111, p. 35, 1920.

Claibornian of Mississippi. It is not as widely distributed as *D. minutistriatum* Gabb.

Typically, the longitudinal ribs are coarse. Usually eight, longitudinal ribs are the most prominent but the number may vary more or less according to the stage of growth of the shell. The primary ribs alternate with about eight, secondary costæ. Between the primary and secondary ribs there is a finer tertiary series. Sometimes there may be two tertiary ribs in place of one. In many cases, the second and third series of ribs may be equal in size. Only the primary ribs are present on the apex. Such ribs are prominent and sharp.

Between four to six millimeters from the point of the apex, the secondary ribs appear. About the same distance anteriorly, the third series of alternating ribs develop. The series of costæ may vary as to relative size. Specimens from localities below the Gosport sand have the characteristic series of ribs but all of the costæ are finer in size than those on the typical specimens from the Gosport sand.

Due to the change in the number of longitudinal ribs from the posterior to the anterior end, cross sections of the shell would vary if taken at intervals in the length of the individual shell. In the fossil state, the shells are frequently broken into short lengths.

There is a small apical notch on the convex side of the shell.

The longitudinal ribs may become obsolete with old age. Fig. 21, plate 1 is a fragment which shows the ribs in the process of disappearing.

The *Dentalium bimixtum* de Gregorio is a senile individual of *thalloides*.

If the smooth and ribbed portions of the same specimen become broken producing two fragments of different character, the relationship is confusing.

Posteriorly the shell of this species is much thicker than anteriorly. The thicker portions are double, the parts differing in texture. The outer, sculptured layer may peel off or be eroded leaving a smooth inner tube. These smooth, inner tubes when separated from the original shell appear like a small, smooth species and probably have been taken as such. Several shells have been figured to show this process of sloughing of the outer layer.

Such a condition is described by Pilsbry and Sharp[22] for the group of *Dentalium entale* of the subgenus *Antalis* H. and A. Adams.

Conrad's type material consists of seven specimens pasted on a card with the holotype not differentiated. The middle specimen on the card is selected as the lectotype. This measures 45 mm., length and 6 mm., greatest diameter.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 728, 729, 731 and 803. Gosport sand: locality 104 (type).

Dentalium (Antalis) thalloides claibornense, new variety

Plate 1, figs. 1, 2, 5

This variety is of the same size and texture as *D. thalloides* Conrad. It has the same characteristic of truncating the posterior end and thickening the layers of shell.

The sculpture of this form consists of medium, equal, longitudinal ribs between thirty and thirty-six in number. Typical *thalloides* has the longitudinal ribs differentiated in size. That *claibornense* is a variation of *thalloides* is shown by the tendency of the ribs in *thalloides* to equalize. It is difficult to separate some specimens. An injured specimen, fig. 26, plate 1, has on the posterior end typical *thalloides* sculpture, large, primary ribs with an alternating, smaller rib. After the injury, numerous, smaller longitudinal ribs are formed and the ribs equalize in size. The anterior end of the specimen has the sculpture of *claibornensis.* The injury causes a quicker change than normal transitional stages.

D. thalloides claibornense bears a resemblance to *D. mississippiense* Conrad[23] from the Vicksburg Oligocene. *D. mississippiense* is here figured on plate 1. Both forms have the longitudinal ribs equal in size. The ribs on the Vicksburg species are larger and fewer in number. There is an average of ten more longitudinal ribs on *D. thalloides claibornense.*

D. minutistriatum Gabb from Claibornian localities below the Gosport sand has the longitudinal ribs equal in size but the ribs are much finer than those in *claibornense.*

The figure of *D. densatum* Conrad[24] suggests sculpture as in

[22]Pilsbry, H. A. and Sharp, B., Man. Conch., Scaphopoda, vol. XVII, p. 39, 1897-98.

[23]Conrad, T. A., Acad. Nat. Sci. Phila., 2d. ser., Jour. vol. 1, p. 112, pl. 11, fig. 1, 1848.

[24]Conrad, T. A., Amer. Jour. Conch., vol. 1, p. 212, pl. 20, fig. 15, 1865.

claibornense. The holotype of the species is in the Academy of Natural Sciences at Philadelphia. It is a large shell, 6.5 mm. greatest diameter. It has sculpture like *D. mississippiense* Conrad but the longitudinal ribs are not so conspicuous as typical specimens. The shell contains a mass of green and white sand, with a large foraminifera in place. This will probably identify the material. Such sediment excludes the specimen from the Gosport sand. Conrad did not give a locality. The original figure is copied herein, pl. 1, fig. 3.

Syntypes.—Nos. 2626, 2627, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 731. Gosport sand: locality 104 (type).

Dentalium (Antalis) blandum de Gregorio Plate 1, figs. 9, 10

Dentalium blandum de Gregorio, 1890, p. 172, pl. 17, fig. 26-31; Dall, 1892, p. 438; Cossmann, 1893, p. 19; Pilsbry and Sharp, 1897-98, Man. Conch., vol. XVII, p. 200.

Testa cylindro-conoidea, costulata; costulis tenuibus, subregularibus L. 20 mm.

Après avoir figuré deux échantillons de cette espèce, j'en ai trouvé un autre plus grand, mais avec les mêmes caractères. Je devrais répéter à propos de cette espèce ce que j'ait dit à propos de la précédente, à laquelle je renvoie le lecteur.

Cette espèc ressemble beaucoup au *Dent. striatum* Sow. (in Deshayes Coq. Paris 2 ed. pl. 1, f. 11).

Coll mon Cabint.—[De Gregorio, 1890].

This species is related to *D. thalloides* but may be readily distinguished from it. It is much smaller in diameter and length than *thalloides*. The curvature of the shell is greater in *blandum*. The ribs on the apex of *thalloides* are eight and sharp. The apical ribs on *blandum* number at least sixteen and are finer than those of *thalloides*. The longitudinal costæ of *blandum* occur in the alternating series of three sizes as in *thalloides*. The secondary ribs begin on the apex in *D. blandum* and the whole series is much finer. The third set of alternating ribs is in many cases faint in *D. blandum*. Minute, longitudinal striations occur between the larger ribs.

In this species the shell may become truncated posteriorly and develop inner tubes which project when the outer layer is eroded. Such a feature is characteristic of *D. thalloides*. The two species are associated.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Lower Claiborne: locality 731. Gosport sand: locality 104.

Dentalium (Antalis) arciforme Conrad Plate 1, figs. 12, 13, 14, 15

Dentalium arciformis Conrad, 1846, Amer. Jour. Sci., vol. 1, 2d. ser., p. 212, pl. 1, fig. 3.
Dentalium arciforme H. C. Lea, 1848, p. 99; Dall, 1892, p. 438; Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, ser. 1, p. 199.
Dentalium leai Meyer, 1886, Geol. Sur. Ala., vol. 1, pt. II, p. 63, pl. 1, figs. 2, 2a.

Regularly curved, tapering very gradually, round, polished, very thick at the apex. (Plate 1, fig. 5)
Claiborne, Alabama.

I have but three imperfect specimens of this species, and they do not suffice to exhibit the complete outline of the shell. It is much more elongated and tapering than Lea's *D. turritum*, which I have not seen. The turrited form of the superior margin of the latter species is probably accidental, the result of fracture.—[Conrad, 1846].

The type of *D. arciforme* Conrad was not found. Conrad was either in doubt as to the validity of the species or forgot its existence for he did not include the name in his later check lists. The figure given by Conrad resembles worn specimens of a *Dentalium* which after numerous comparisons, I believe to be distinct.

The holotype of *D. leai* Meyer has been examined. Through the courtesy of Prof. E. W. Berry, the type was loaned to me. With the type specimen before me together with numerous specimens of eroded inner tubes of *D. thalloides* in different stages of development and several specimens which duplicate in character *D. leai* Meyer, I believe that there is a smooth species of *Dentalium* in the Gosport sand. There is no question but that the specimen of figs. 12, 14, on plate 1 is the same as *D. leai* Meyer. Meyer's type retains a small portion of the original thin, smooth polished surface. The specimens figured herein have the exterior surface worn. Meyer's specimen and the specimens in the Harris collection are thick with an inner layer. The apical opening is in good condition. There is a well developed notch on both the convex and concave surface, with a conspicuous inner sheath projecting. They resemble the shell and the character of the apical opening of *D. pretiosum* 'Nuttall' Sowerby as illustrated by Pilsbry and Sharp[25].

[25]Pilsbry, H. A. and Sharp, B., 1897-98, p. 44, pl. 13, figs. 1, 2, 3.

The specimens which are the same as *D. leai* resemble the figure of *D. arciforme* Conrad. Conrad mentioned that the apical end of the shell was thick. This is a distinct character of the specimens noted. Conrad's name is the oldest used for such type of shell. Meyer suggested with doubt that *D. arciforme* Conrad was the same as his species. Pilsbry and Sharp placed the two together.

Worn specimens of *D. arciforme* with the aperture destroyed may be confused with the eroded inner tubes of *D. thalloides* Both are equally numerous in a large collection of Dentalia in the Gosport sand. They may be distinguished by the greater thickness of the shell of *D. arciforme* particularly of the apical end. Posterior worn fragments of each may be confused.

Dimensions.—Greatest diameter, 3 mm. fragment. Length, 8 mm.; greatest diameter, 2.5 mm., holotype, *D. leai* Meyer (small fragment).

Holotype.—Probably lost. Holotype *D. leai* Meyer, Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala.

Dentalium (Antalis) minutistriatum Gabb Plate 2, figs. 33-36, 38, 41

Dentalium minutistriatum Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser., vol. IV, p. 386, pl. 67, fig. 46; Conrad, 1865, p. 34; Conrad, 1866, p. 10; Heilprin, 1891, p. 401; Dall, 1892, p. 438; Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 209.

cf. *Dentalium annulatum* Meyer, 1886, p. 64, pl. 1, fig. 7.

cf. *Dentalium minutistriatum* Gabb? Cossmann, 1893, p. 19, pl. 1, fig. 22.

Very slightly curved, marked by numerous small longitudinal ribs, all of the same size, no trace of alternation; aperture round.

Dimensions.—Length 1 in., width of aperture .08 in.

Locality.—Common at Wheelock.—[Gabb, 1860].

This species is typical of Claibornian localities below the Gosport sand. It is generally distributed and at certain localities abundant.

The species may be distinguished by the regular, longitudinal, microscopic striations. The longitudinal striations may become obsolete with old age or easily eroded. Hence a large number of smooth specimens may be found at certain localities. A characteristic feature of some localities is the microscopic annulations on the young portions of the shell. Fragments may be found which have only such lines present. The lines are conspicuous under the microscope.

Complete specimens show the annular striations posteriorly with the initial development of the longitudinal lines. Adult specimens with well developed ornamentation reveal fine, concentric lines beneath the longitudinal. The anal orifice contains an inner tube thinner than the outer layer. Both are notched on the convex side of the shell.

Meyer[26] pointed out the annulated character of the shell of *D. minutistriatum*. Dr. Dall[27] also noted the feature. He suggested that *D. annulatum* Meyer from Claiborne, Ala., an annulated species, was the young *D. minutistriatum*. *D. annulatum* Meyer is discussed later as is also the *D. minutistriatum* ? Gabb found by Cossmann in the Gosport sand.

Holotype.—No. 13264, Academy of Natural Sciences, Philadelphia, Pa. [Broken].

Occurrence.—Lower Claiborne: Wheelock, Texas (type). Localities 707, 723, 724, 725, 726, 727, 728, 730, 731, 733, 734, 741, 747, 756, 765, 766, 767, 832, and 843. Gosport sand, Claiborne, Ala. [fragment Cossmann; Meyer fragment *D. "annulatum"* Meyer].

Dentalium, sp. Plate 1, figs. 8, 11

Known apices small with about twelve, sharp, longitudinal ribs. Shell of small apical fragments only slightly rounded on the concave side.

Anteriorly, fine intermediate ribs are developed which increase in size until a specimen of 2 mm. greater diameter, has about 20 equal, longitudinal ribs. Finer alternating ribs develop which equalize in size with the primary ribs. An adult specimen of 4 mm. greatest diameter has about 28 longitudinal ribs with or without fine, intermediate lines.

The curvature of the shell is slight.

The above description is made from a few specimens from different localities. For this reason, the species is not named. With too few specimens one cannot check a developmental series.

The apices are distinct and do not belong to any known Clabornian species. They differ from *D. thalloides* in having four or more longitudinal ribs. *D. minutistriatum* lacks large, longitudinal ribs on the apices. *D. blandum* has sixteen or more lon-

[26]Meyer, O., Geol. Sur. Ala., Bull. No. 1, pt. II, p. 64, 1886.
[27]Dall, W. H., 1892, p. 438.

gitudinal ribs on the apices as does *D. micro-stria* Heilprin[28] from the Sabine Eocene. Specimens of *D. microstria* have been figured on plate 2, figs. 42, 43 for comparison.

A holotype is chosen from one of the apex fragments. Attention is called to the form in the hope that future work will discover a complete specimen.

Holotype.—No. 2640, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 725, 733 and 741 (type).

Dentalium incississimum Meyer and Aldrich Plate 1, figs. 4, 6

Dentalium incississimum Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., vol. IX, p. 40, pl. II, fig. 1; Dall, 1892, p. 439; Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 206.

Smooth, polished, gradually tapering. Section circular. Aperture with a long narrow slit.

Wautubbee.—[Meyer and Aldrich, 1886].

Fragments of a smooth *Dentalium* have been found at Wautubbee, Miss., which probably are this species. They are more curved than the type figure. One is figured. It is referred to *Dentalium* sp. in the explanation of plates until better material is discovered.

Dimensions.—Length, 6 mm.; greatest diameter, 1.5 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: locality 731.

Dentalium "annulatum" Meyer Plate 2, fig. 37

Dentalium annulatum Meyer, 1886, Bull. Geol. Sur. Ala., vol. I, pt. II, p. 64, pl. 1, fig. 1; de Gregorio, 1890, p. 173, pl. 17, fig. 45; Dall, 1892, p. 438; Cossmann, 1893, p. 19; Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 198; nec *D. annulatum* Gmelin, 1788 nec *D. annulatum* Sandberger, 1842 nec *Entalis annulatum* Tate, 1887 nec *Entaliopsis annulata* Newton and Harris, 1894.

The name given by Meyer is preoccupied but until the species is established as distinct from *D. minutistriatum* Gabb, a new name would only add more confusion.

This form as Dr. Dall pointed out is like the young of *D. minutistriatum* Gabb. Such a fact would be accepted readily if one were sure Meyer's specimen had not come from the Gosport

[28]Heilprin, A., Acad. Nat. Sci. Phila., Proc., vol. 32, p. 375, pl. 20, fig. 3, 1880.

sand.

D. minutistriatum is characteristic of the Claibornian formations below the Gosport sand and has not as yet been obtained with certainty from the Gosport sand. But none of the young specimens of the species in the "sand" reveals fine annulations as on the Meyer specimen.

The type specimen is a fragment of the apical end of a young specimen of a species of *Dentalium*. Under the lens, the microscopic annulations are conspicuous. A comparison of the type specimen has been made with young specimens of *D. minutistriatum*. The annulations are of the same size and character on both.

Meyer stated there was a difference. He pointed out that there was no trace of longitudinal striations on the type specimen of *D. annulatum*. Such a lack of character is not pertinent in this diagnosis because the specimen is only a fragment. Some fragments larger than Meyer's do not show longitudinal striations. Whether they show on apical fragments is merely a matter of whether the shell is broken at a point preceding the development of the longitudinal striations.

The type specimen also has a thin inner tube which is of the same character as that of *D. minutistriatum*. The type specimen has been examined in regard to color, attached sand grains and matrix to determine whether the specimen might have come from a lower horizon at Claiborne than the Gosport sand. The specimen has a yellowish tinge and has yellowish red sand grains attached which suggests it came from the "sand". There is not enough matrix in the shell to make an exact determination. Since Meyer's material from Claiborne came from the Gosport sand the occurrence of this specimen is so assigned.

As a tentative arrangement the form is placed as the young of *D. minutistriatum* extending the range of *D. minutistriatum* to the Gosport sand. Influencing the decision as to the Meyer specimen is the fact that Cossmann figured a small fragment which he found in the Gosport sand. Cossmann determined the specimen doubtfully as *D. minutistriatum* Gabb.

Dimensions.—Length, 3 mm.; greatest diameter, 1 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University. Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala.

Dentalium multistriatum Heilprin in Aldrich, 1886, Geol. Sur.

Ala., No. 1, pt. I, p. 46, Monroe County and Lisbon, Ala., is a nomen nudum. It is probably an error in spelling of either Heilprin's or Gabb's species.

Dentalium minutistriatum var. *dumblei* new var., in Kennedy, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, pp. 97, 114, 123, 126, 128, 130 is a nomen nudum. Harris proposed the name in his Texas Eocene MS., but the name was not published.

Dentalium gnizum de Gregorio (see under *Cadulus*).

Family SIPHONODENTALIIDÆ

Genus CADULUS Philippi, 1844[29]

Genotype by monotypy, *Dentalium ovulum* Philippi. Recent. Mediterranean and Bay of Biscay. Miocene and Pliocene of Italy.

Cadulus (Cadulus) ouachitensis, n. sp. Plate 2, figs. 18, 19

Shell small; obese; typical *Cadulus* s. s.; greatest inflation about medium in length; apical end constricted more than the posterior and flattened dorsally and ventrally while the anterior aperture is rounded; ventral line is nearly straight.

The species is found in the Clairbornian Eocene at Lapiniere Landing on the east bank of the Ouachita River, and at Columbus, Louisiana where it is fairly common. It may be the species which authors[30] have reported from the Claibornian of Texas and Louisiana as *Cadulus juvenis* Meyer[31], a Jacksonian species. *C. ouachitensis* differs from *C. juvenis* Meyer, in being more constricted posteriorly. This gives *C. ouachitensis* an appearance of greater inflation.

Dimensions.—Length, 2 mm. (chord subtending the arc of the shell); greatest diameter, 0.7 mm.

Syntypes.—Nos. 2644, 2645, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 741 (type) and 724.

Subgenus POLYSCHIDES Pilsbry and Sharp, 1897[32]

Genotype by original designation, *C.* (*Polyschides*) *tetraschistus* (Watson). Recent. Anchorage off Fernando Noronha off Brazil, 25 fathoms (Challenger).

[29]Philippi, R. A., 1844, vol. 2, p. 209, pl. XXVII, fig. 21.
[30]Aldrich, T. H., Bull. Amer. Pal., vol. 1, No. 2, p. 4, 1895; Vaughan, T. W., U. S. Geol. Sur., Bull. No. 142, p. 45, 1896; Renick, B. C., and Stenzel, H. B., Univ. Texas. Bull., No. 3101, p. 103, 1931.
[31]Meyer, O., Geol. Sur. Ala., Bull. No. 1, pt. II, p. 66, pl. 3, fig. 4, 1886.
[32]Pilsbry, H. A., and Sharp, B., 1897-8, p. 146.

Cadulus (Polyschides) newtonensis Meyer and Aldrich

Plate 2, figs. 39, 40

Cadulus newtonensis Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour., vol. IX, p. 40, pl. II, figs. 3, a, b; Dall, 1892, p. 444; Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2 p. 4.

Cadulus (*Polyschides*) *newtonensis* (Meyer and Aldrich) Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 237 [partim], [age of Newton and Jackson, Miss., erroneous].

Two depressed fragments from Newton show an aperture which is different from the other known apertures of Cadulus of the Southern Eocene. Two distinct deep notches on the convex side, and two less distant emarginations on the concave side of the shell divide the margin of the elliptical aperture into four appendages, of which the two small opposite ones are equal, the two larger ones however, very unequal. It may be that this form represents the aperture of the preceding species, of which we have no example. If, however, the form should prove to be a new species we propose the name *Cadulus Newtonensis* for it.—[*Meyer* and *Aldrich*, 1886.]

This species has been verified by an examination of the holotype. The Harris collection contains a single specimen of this species. It is from Wautubbee, Miss. Although the anterior end is broken, the posterior end reveals a similar character of slitting to that on *C. newtonensis.*

Dall and later Aldrich believed that the *Cadulus jacksonensis* Meyer[33] described from the Jackson Eocene was the same as this species. The figures of the two show a resemblance.

Cossmann[34] reported finding two imperfect specimens of *jacksonensis* from the Gosport sand. He classified the species as a *Siphonodentalium.* The determination of the species cannot be verified but the species is undoubtedly a *Cadulus.*

Dr. Dall listed *C. newtonensis* as occurring in the Chipola Miocene of Florida and Chesapeake Miocene of Maryland. This range is questioned until verified by examination of Miocene specimens.

Dimensions.—Length, 7 mm. (chord subtending the arc of the shell).

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Newton, Miss. (type); locality 731.

Cadulus (Polyschides) turritus (Lea) Plate 78, fig. 2

Dentalium turritum Lea, 1833 p. 35, pl. 1, fig. 3; Lea, H. C., 1848, p. 99; Conrad, 1865, p. 34; Conrad, 1866, p. 10; de Gregorio, 1890, p. 172 [partim], pl. 17, figs. 39-40; Cossman, 1893, p. 19 [partim]; Harris, 1895, p. 46.

[33]Meyer, O., Amer. Jour. Sci., 3d. ser. vol. 29, p. 462, 1885 not described; Geol. Sur. Ala. Bull. No. 1, pt. II, p. 65, pl. 3, figs. 8, a, b, 1886.
[34]Cossmann, M., 1893, p. 20.

Cadulus turritus (Lea) Meyer, 1885, Amer. Jour. Sci., 3d ser., vol. 29, p. 463; Dall, 1892, p. 444; Aldrich, 1895, Bull. Amer. Pal. vol. 1, No. 2, p. 4.

Cadulus (Polyschides) turritus (Lea) Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 239.

Shell slightly curved, smooth, polished, rather thin; posterior termination furnished with four turret-like appendages; aperture round.

Observations.—A single specimen only of this curious species has come under my notice. The turrited form of the posterior or smaller termination does not seem to have been noticed in any of the ten species described by Sowerby, nor in the twenty-one by Lamarck. The space between the turrets is festoon like. This remarkable termination eminently distinguishes it from all other species yet described.

The smaller figure is the size of nature.—[Lea, 1833].

The holotype of this species was not found for study during a recent visit to the Academy of Natural Sciences. Prof. Harris catalogued the type in 1895. Meyer made an excellent drawing of the holotype. His illustration, which is included in this paper, reveals the specimen to be a *Cadulus* subgenus *Polyschides.* Pilsbry and Sharp apparently studied the type, when they gave their determination in 1898. Specimens have not been found subsequently.

Holotype.—No. 5015, Isaac Lea Collection, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Cadulus (Polyschides) quadriturritus Meyer — Plate 2, figs. 13, 14

Cadulus quadriturritus Meyer, 1886, Geol. Sur. Ala. Bull., No. 1, pt. II, p. 65, pl. 3, figs. 7, 7a; Dall, 1892, p. 444; Aldrich 1895, Bull. Amer. Pal., vol. 1, No. 2, p. 5;

Cadulus (Polyschides) quadriturritus (Meyer) Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 238.

Not compressed; inflation near the end distinct but gradual; smaller aperture with four equal rounded appendages, divided by notches of the same shape.

Locality.—Red Bluff, Miss.—[Meyer, 1886].

Shell medium in size; maximum swelling anterior to the middle; convex dorsally; concave posterior to middle on the ventral side; compressed dorso-ventrally enough to give an oval shape; there are four notched apical slits; posterior slender.

This species differs from *C. subcoarcuatus* Gabb in having the equator nearer the middle of the shell, there being a longer slope from the enlarged area to the anterior margin. *C. subcoarcuatus* is between *C. abruptus,* where the equator is near the anterior end and *C. quadriturritus* where it is nearer the middle line.

Cadulus quadriturritus Meyer is a typical *Polyschides*. One lower Claiborne specimen shows the apical slits. The Harris collection contains numerous perfect specimens from the Jackson Eocene. Several show the apical notches. The original figure indicates they were present on the holotype. So far as the present material indicates, *C. subcoarcuatus* is a *Dischides*. Such subgeneric differentiation will not be practical in routine determination. The fossil Caduli are frequently broken so that one cannot always find specimens with the apical slits preserved.

Dimensions.—Length, 9 mm.; greatest diameter, 2 mm.; smallest diameter, apical end, .75 mm., specimen from Moody's Branch, Miss. Jackson Eocene.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: locality 741. Jackson Eocene. Oligocene: Red Bluff, Miss. (type).

Subgenus DISCHIDES Jeffreys, 1867[35]

Genotype by original desgination, *Dentalium bifissum* S. V. Wood.=*D. politum* S. V. Wood. Living. Western Atlantic to Mediterranean. Pliocene and Pleistocene. England and Italy.

Cadulus (Dischides) subcoarcuatus (Gabb) Plate 78, fig. 1

Ditrupa subcoarcuata Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser., vol. IV, p. 386, pl. 67, fig. 47.

Gadus subcoarctatus Conrad, 1866, p. 10; Conrad, 1866, Amer. Jour. Conch., vol. II, p. 75; Heilprin, 1891, p. 401.

Cadulus subcoarcuata (Gabb) Meyer, 1884, Acad. Nat. Sci. Phila. vol. 36, p. 112.

Cadulus subcoarctatus Dall, 1892, p. 444; Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2, p. 4, non pl. 1, figs. 1, 2, 4.

Cadulus subcoarcuatus (Gabb) Pilsbry and Sharp, 1898, Man. Conch. vol. XVII, p. 238.

Arcuate, widened in advance of the middle; aperture contracted, circular; surface polished.

Dimensions.—Length .33 in., greatest diameter .07 in., diameter .035 in.

Locality.—Common at Wheelock.—[Gabb, 1860].

Gabb's figure of the holotype is poor. The Meyer drawing of the holotype has been compared with the specimen. The drawing is good and is included in this report. Meyer shows the small slits at the apical end. Several specimens have been found which reveal similarly placed slits. The margin of the shell away from the slits in all cases is broken so that the true nature may

[35]Jeffreys, J. Gwyn, Ann. Mag. Nat. Hist., ser. 3. vol. XX, p. 251 (in text), 1867.

not yet be determined. The species is common at Moseley's Ferry and two and one-half miles above Stone City, Little Brazos River, Texas. Most of the specimens have the apical end broken sharply and regularly, leaving an even margin, hence the species would appear to lack the apical slits. From the character of the most perfect of the slits preserved, one assumes the anal opening to be bilabiate and the species to belong in the subgenus *Dischides*.

The species is distinct from *Cadulus abruptus* Meyer and Aldrich although it was placed as synonymous with that species by Dall. The enlargement of the shell is near the anterior end in *C. abruptus* while *C. subcoarcuatus* is swollen more posteriorly and the slope anteriorly is more gradual.

The change in the spelling and meaning of this name has taken place through the implication by authors that Gabb misspelled the name. A change in the spelling was made first by Conrad and carried through literature even by recent authors[36]. However Gabb spelled the name the same in the text, explanation of plates and on the original label with the holotype. It seems, as Pilsbry and Sharp have suggested, that the name as written by Gabb was as he intended it. A change in spelling is not justified nor valid.

Dimensions.—Length, 9.5 mm., (chord subtending the arc of the shell); greatest diameter, 1.5 mm.

Holotype.—No. 13263, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 723, 724, 725, and 727. Wheelock, Texas (type).

Cadulus ("Dischides") abruptus Meyer and Aldrich

Plate 2, figs. 15, 16, 23, 24, 25

Cadulus abruptus Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour., vol. IX, p. 40, pl. II, fig. 2; Dall, 1892, p. 444 [partim]; Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2, p. 4 [partim], pl. 1, figs. 1, 2. [labelled *C. subcoarctatus* Gabb var.]; Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 235, [erroneous age given]; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 5, pl. 1, fig. 3; Clark and Martin, 1901, Md. Geol. Sur., Eocene, p. 159, pl. XXIX, fig. 9.

Rather large, somewhat depressed. Inflation very near to the larger aperture and suddenly decreasing.

Newton, Wautubbee.

The type specimen is from Newton. Form and position of the inflation distinguish it from the other species of Cadulus of the Southern Tertiary.—[Meyer and Aldrich, 1886.]

36Clark, Wm. B., U. S. Geol. Sur. Bull. No. 141, p. 72, 1896; Vaughan, T. W., U. S. Geol. Sur. Bull. No. 142, p. 45, 1896; Renick, B. C. and Stenzel, H. B., Univ. Texas Bull. No. 3101, p. 103, 1931.

Contrary to Dall's and Aldrich's opinion, this species is distinct from *C. subcoarcuatus* Gabb. As the name implies the greatest enlargement of the shell is near the anterior end from which the anterior slope drops abruptly to the margin of the aperture. There is a slight flare of the shell at the aperture .

This species is abundant in the Sabine Eocene. Examination of numerous, otherwise perfect shells from Sabine Eocene localities failed to reveal a specimen with apical ends showing slits. Aldrich figured a specimen showing two sulci. He stated that another specimen had "five sulci with notches." If the specimens were natural and not broken the two specimens could not represent the same species.

Since the Aldrich specimen with the two sulci is *C. abruptus* as shown by the accompanying figure, the species is tentatively placed in the subgenus *Dischides*. If the five clefts of the other specimen are authentic it may be a *Siphonodentalium*.

Clark and Martin determined in 1901, the previously described *Cadulus bellulus* Clark[37] from the Aquia (Sabine) and Nanjemoy (Claibornian) Eocene formations of Maryland as equivalent to *C. abruptus* Meyer and Aldrich.

Dimensions.—Length, 12 mm. (chord subtending the arc of the shell) ; greatest diameter, 2.5 mm., Aldrich collection, Johns Hopkins University.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Sabine Eocene. Lower Claiborne Eocene: localities 726, 728, 734 and 778.

Cadulus depressus Meyer Plate 2, fig. 17

Cadulus depressus Meyer, 1884, Acad. Nat. Sci. Phila., Proc. vol. 36, p. 111, text fig.; Dall, 1892, p. 444; Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2, p. 4; Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 236.

Smooth, shining, gently curved; inflation not very prominent. Section everywhere an oval, one side of which is a little flatter than the other. Both ends oblique.

Length 7 mm.

Locality.—Eocene sand from Claiborne, Ala.

Remarks.—The aperture of the figured specimen is not perfect, but I know that it is of the form indicated in the figure, from other specimens. I have seen altogether about a dozen specimens, and all are everywhere of

[37]Clark, W. B., Johns Hopkins Univ. Circ., vol. XV, p. 5, 1895; U. S. Geol. Sur., Bull. 141, p. 72, pl. XIV, fig. 6, 1896.

the same oval section.—[Meyer, 1884].

Specimens have not been found in the Gosport sand.

Meyer's figure of the holotype does not represent the shape well. For lack of better, the original drawing is included.

The specimen resembles *C. abruptus* Meyer and Aldrich. It is smaller and more slender than the average *C. abruptus*.

Dimensions.—Length, 7 mm. (chord subtending the arc of the shell); greatest diameter, 1 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala.

Cadulus compressus Meyer, 1885, Amer. Jour. Sci., vol. 29, 3d. ser. pp. 463, 468, is a nomen nudum.

Dentalium gnizum de Gregorio, 1890, p. 173, pl. 42-43 as pointed out by Pilsbry and Sharp, 1898, Man. Conch., vol. XVII, p. 205, suggests a *Cadulus*. The specimen is only a posterior end of a specimen and therefore indeterminable. Its status has been doubted by Dall, 1892, p. 438 and Cossmann, 1893, p. 19.

Class GASTROPODA

Subclass PROSOBRANCHIATA

Family FISSURELLIDÆ

Genus DIODORA Gray, 1821[38]

Iredale, Tom., Proc. Mal. Soc. London, vol. 11, p. 331, 1915.

Genotype by monotypy *Patella apertura* Montagu[39] [immature *Fissurella græca* auct. non Linné, 1766[40]]. Living. British Isles.

Diodora tenebrosa (Conrad) Plate 3, figs. 2, 7, 9, 10, 12, 13

Fissurella tenebrosa Conrad, 1833, Sept. p. 33, [non pl. 17, fig. 5]; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 39, pl. 15, fig. 9; H. C. Lea, 1848, p. 99; d'Orbigny, 1850, p. 371; Conrad, 1865, p. 34; Conrad, 1866, p. 10, de Gregorio, 1890, p. 147, pl. 14, figs. 10-16; Cossmann, 1893, p. 20; Harris, 1895, p. 45.

Fissurella Claibornensis Lea, 1833, Dec., p. 95, pl. 3, fig. 74; H. C. Lea, 1848, p. 99; Harris, 1895, p. 11, [synonym]; Cossmann, 1893, p. 20.

Fissuridea tenebrosa (Conrad) Pilsbry and Johnson, 1892, Jan., Nautilus, vol. V, No. 9, p. 106; Dall, 1892, p. 425.

Shell ovate or oval, elevated, with numerous delicate raised costæ, decussated by transverse striæ; inferior margin with impressed lines; apex pointed. Length 1 inch.

[38]Gray, J. E., London Medical Repository, vol. XV, p. 233, Mar. 1, 1821;
[39]Montagu, G., Testacea Britannica, vol. II, p. 491, pl. XIII, fig. 10, 1803.
[40]Lowe, R. T., 1827, p. 77; Iredale, T., 1915, p. 331.

Locality.—Claiborne, Alab.
Cab. Acad. N. S.—[Conrad, 1833].

Oval, elevated, slightly compressed above; with numerous delicate costæ alternated in size, and crossed by very fine striæ, giving the ribs a granulated appearance; fissure narrow, inclined; inferior margin with crenulations disposed in pairs.
Syn. F. CLAIBORNENSIS, *Lea. Con. p.* 94, *pl.* 3, *f.* 74.
Locality.—Claiborne, Alab.
Rare and seldom perfect. No. 3; first ed. p. 33.—[Conrad, 1835.]

Shell large, anterior slope convex, posterior slope concave, apex acute, beak-like in many cases; apical perforation large, truncated posteriorly, the interior with a heavy, marginal callus and posterior pit; the sculpture consists of well developed radial ribs. In the young, every second rib is a primary. With age, additional, radiating ribs are set in, until the primary rib becomes every fourth one. The ribs on the anterior end are slightly more uniform in size than those posteriorly. Concentric, fine lines occur over the whole surface.

The sculpture of this species seems to be of a similar character to *D. compsa* Woodring[41] from the Bowden Miocene of Jamaica. That species has greater convexity in shape. If the holotype represents an adult then the Eocene form attains a size four times larger. The Bowden species being known only by one shell, there is a possibility that the species may attain a larger size. The sculpture in *tenebrosa* is much finer in young specimens than in adult so that factor would not argue for a difference specifically unless shells of the same age are compared.

Specimens from Claibornian localities below the Gosport sand have the concentric lines stronger than the type form giving the sculpture a sharper, cancellate appearance. The aperture of the lower Claibornian form seems to perforate more of the apex, eliminating the beak. Lack of the beak is a conspicuous difference which will distinguish lower Claiborne specimens from those of the Gosport sand. A specimen from Hickory, Miss., is figured. It is a young shell. It shows the stronger ribs which alternate with a smaller rib in the young. This is true of typical specimens of the young from the Gosport sand. The adult shells of the lower Claiborne localities have the primary shells with three, smaller radiating ribs between as on typical specimens.

[41]Woodring, W. P., 1928, p. 454.

The Conrad type material consists of two large and two small specimens. One of the smaller specimens which on the Conradian card is in the lower right hand corner is chosen as the lectotype. The lectotype measures 18 mm. in length.

Fissurella claibornensis Lea is a young specimen of *F. tenebrosa* Conrad.

Dimensions.—Length, 33 mm.; width, 25 mm.; height, 16 mm.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. Holotype of *F. claibornensis* Lea, No. 5450, Academy of Natural Sciences.

Occurrence.—Sabine Eocene: Woods Bluff, Ala. (Aldrich collection). Lower Claiborne: localities 708, 728, 730 and 731. Gosport sand: locality 104 (type).

Diodora infrequens (Aldrich) Plate 3, figs. 4, 5

Fissuridea infrequens Aldrich, 1903, Nautilus, vol. XVI, No. 9, p. 98, pl. III, figs. 8, 9.

Shell medium size, with broadly ovate periphery at base, rather depressed; substance of shell thin; foramen in anterior half, small and narrowly ovate. Greatest breadth at base 22 mm., height 6 mm.

Locality.—On the Chickasawhay River, three and one-half miles below Quitman, Miss., below the *O. sellæformis* bed, Claibornian.

This species differs from any Tertiary species known by the very thin shell in comparison with its size, and its very fine cancellation. The interior is filled with matrix.—[Aldrich, 1903.]

The sculpture consists of primary, radiating ribs with intervening, finer, radiating ribs.

The interior of the holotype is filled with matrix so that the generic determination of *Diodora* was not verified. However, the specimen is well illustrated and the exterior is that of typical *Diodora*.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Genus **PUNCTURELLA** Lowe, 1827[42]

Genotype by original designation, *Patella noachina* Linné. Living. Circumpolar.[43]

Subgenus **FISSURISEPTA** Seguenza, 1863[44]

Genotype by subsequent designation, Woodring[45], 1928, *Fis-*

[42]Lowe, R. T., Zoological Journal, vol. 3, pp. 77, 78, 1827.

[43]Johnson, C. W., Proc. Bost. Soc. Nat. Hist. vol. 40, No. 1, p. 67. 1934. [The American Atlantic distribution of "south to Cape Fear" is limited to *P. princeps* Mighels and Adams].

[44]Seguenza, G., Annali del' Accademia degli Aspiranti Naturalisti, Napoli, ser. 3, vol. 2, p. 83, 1862. (1863) [fide Woodring].

[45]Woodring, W. P., 1928, p. 454.

surisepta papillosa Seguenza. Miocene. Sicily.

Section **FOLIA**, new section

Type *Puncturella altior* (Meyer and Aldrich) Clairbornian Eocene. Mississippi.

Shell medium, high, ovate. Apex absorbed by the anal foramen. The anal opening has two, callous protuberances on the anterior side which leave a narrow constriction of the foramen at that place; the internal septum is thin, slightly oblique and concave on its lower margin. The sculpture is coarse, consisting of conspicuous, radiating and concentric ribs. The intersections of the two systems of ribbing on the type species are spinose.

Puncturella trifolium Dall[46] living in Yucatan Straits belongs to this section. On Dall's species the lower margin of the septum is convex. The edge of the septum and the two knobs of the foramen give the opening, when viewed from below, a trilobate appearance. The edge of the septum in *altior* is concave hence when the foramen is viewed from below, it has a bilobate outline. The character of the anal opening is the same in both species.

Puncturella (Fissurisepta) altior (Meyer and Aldrich)

Plate 3, figs. 1, 3, 6, 8

Fissurella altior Meyer and Aldrich, 1886, Jour. Cincinnati Soc. Nat. Hist., vol. IX, No. 2, p. 41, pl. II, figs. 16, 16a, 16b; Cossmann, 1893, p. 20.

Glyphis altior (Meyer and Aldrich) Pilsbry and Johnson, 1892, Nautilus, vol. V, No. 10, p. 113.

Height two-thirds of the length of the aperture. Fissure on the apex nearly circular. Surface covered by alternating, radiating and revolving ribs. The crossing points of the larger ribs are mostly nodulous and scaly.

Wautubbee, Newton.

The type specimen is from Wautubbee. *Fissurella Claibornensis* Lea is lower, and has an oblong and less central fissure, a different sculpture and a different inside.—[Meyer and Aldrich, 1886.]

The holotype is a perfect specimen. It measures length, 13 mm.; height, 10 mm.

This form is exceedingly interesting since it is the second species of the subgenus reported from eastern America. Dr. Woodring discovered the first species in the Bowden beds of Jamaica. The Eocene shells are less convex on the posterior apical area

[46]Dall, W. H., Bull. Comp. Zool. Har., vol. IX, p. 76, 1881; Dall, ibid, vol. XVIII, p. 403, pl. XXVI, figs. 8, 8b, 1889; Pilsbry, H. A., Man. Conch., vol. XII, p. 237, pl. 27, figs. 50, 51, 1890.

than are the Miocene. *F. altior* has the intersections of the primary, radiating and concentric ribs developed into prominent, scaly spines. These are better developed on the posterior slope. The triangular plate on the interior of the apex extends slightly obliquely. The anterior side of the interior of the opening has two small, callus protuberances.

The foramen is slightly anterior to the summit. Additional interest in the form is a relationship to *P. trifolium* Dall of the Recent Yucatan fauna, which has the same unique anal opening.

A *Puncturella* was reported by Otto Meyer[47] from the Jackson Eocene in 1887. The shell was only 2 mm. high and Dall thought it might belong elsewhere after maturity. However, Meyer describes a septum as occurring which would place the species within the limits of *Puncturella,* the exact relationship depending upon whether the apex would be absorbed or not with additional growth.

Dimensions.—Length, 18± mm.; width, 13 mm.; height 12 mm., (broken specimen).

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 728, 731, and 770.

Genus **EMARGINULA** Lamarck, 1801[48]

Genotype by monotypy *E. conica* Lamarck (*Patella fissura* Linné). Miocene through Pleistocene. Living. Finland, coasts of Great Britain to the Adriatic[49].

Section **ARGINULA** new section

Type *Emarginula arata* Conrad. Claibornian Eocene. Southern United States.

Shell large, ovate; base not level; apex situated about one-third the distance from the posterior end; apex coiled back having a beak-like appearance; anal slit broader and shorter than in the genus sensu stricto; the anal fasciole does not seem to be slightly sunken nor the slit cut between two, primary ribs as typical of the genus. The sculpture of the anal fasciole in *Arginula* is raised above the surface of the radiating ribs; the fasciole ex-

[47]Meyer, O., Ber. d. senckenb. naturf. Ges., 1886, p. 6, pl. 1, fig. 15, 1887.
[48]Lamarck, J. B., 1801, p. 69.
[49]Harmer, F. W., Pal. Soc., vol. LXXV, The Pliocene Mollusca, vol. II, pt. III, p. 777, 1923.

tends to the apex where it becomes obscure on the smooth surface of the apical tip; strong muscle scars are seen on the interior; the impression is in the form of a crescent; the extremities pointed anteriorly, are deeply indented and continue broadly parallel with the anal fasciole; on the interior of the shell, the line of the fasciole is raised in a ridge which extends from the slit to about half way to the apex and then divides into two equal arms; the margin of the interior is broadly thickened as well as the interior border back of the notch; young shells are more flattened posteriorly and the margin of the shell is thinner; the muscular impressions and interior fasciole ridge are developed; the exterior sculpture gives the interior margin a crenulated appearance; the sculpture consists of coarse, radiating ribs which on the type species alternate in size.

Typical *Emarginula* is short and high. The type species of *Arginula* is lower and longer. Differences in shape are probably only specific.

The character of the muscular impression as seen on the fossil shells is like that described by Forbes and Hanley[50] for *Emarginula*. These authors do not state what Recent species they used for the description.

Emarginula arata Conrad — Plate 3, figs. 11, 14, 15, 16

Emarginula arata Conrad, 1833, Nov. p. 44; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 39, pl. 15, fig. 8; H. C. Lea, 1848, p. 99; d'Orbigny, 1850, p. 372; Conrad, 1865, p. 34; Conrad, 1866, p. 10; de Gregorio, 1890, p. 147, pl. 14, fig. 17; Pilsbry and Johnson, 1892. Jan., Nautilus, vol. V, No. 9, p. 107; Dall, 1892, p. 429; Cossmann, 1893 p. 21; Harris, 1895, p. 6.

Subovate, with numerous angular or acute ribs, alternating in size; crossed by fine regular striæ; apex nearly central, pointed and incurved; fissure wide, extending about one-seventh the length from the apex; inner margin waved.—[Conrad, 1833].

Ovato-oblong, with angular ribs, largest anteriorly, alternated in size and crossed by close set wrinkles; apex central, acute, much curved; fissure wide but not very profound.

Locality.—Claiborne, Alab.

This elegant species is extremely rare. No. 4, first ed., p. 44.—[Conrad, 1835].

Shell large, base in adult not level, fairly level in immature specimen; sculpture coarse, similar on medium sized specimens

[50]Forbes, E. and Hanley. S., History of Brit. Moll., vol. II, p. 476, 1850.

as on old. Other characters described by Conrad or are given under the description of the section.

The Conrad type collection consists of two specimens. The smaller of the two is the lectotype. It measures length, 29 mm., and height, 12 mm.

This species is as yet the only representative of the Emarginulas so far known in the eastern United States fauna until the Pliocene[51]. Woodring[52] found a typical form in the Bowden Miocene of Jamaica.

Dimensions.—Length, 29 mm.; width, 20 mm., height, 13 mm.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Family TROCHIDÆ

Genus SOLARIELLA S. Wood, 1842[53]

Genotype by monotypy *S. maculata* Wood. Pliocene. England.

Solariella stalagmium (Conrad) Plate 4, figs. 15, 16, 18, 19, 20, 21
Plate 78, figs. 5, 6, 9, 10, 11

Solarium stalagmium Conrad, 1833, Nov., p. 44; Conrad, 1834, App. in Morton, p. 3; H. C. Lea, 1848, p. 106; d'Orbigny, 1850, p. 348; Conrad, 1835, p. 48, pl. 17, fig. 6; de Gregorio, 1890, p. 137, pl. 12, figs. 10, 11; Harris, 1895, p. 42.

Solarium elegans Lea, 1833, Dec., p. 121, pl. 4, fig. 109.

Architectonica stalagmium Conrad, 1865, p. 30; Conrad, 1866, p. 13.

? *Delphinula solaroides* Heilprin, 1879, Acad. Nat. Sci., Phila., Proc. vol. 31, p. 211, pl. XIII, fig. 2; Meyer, 1887, Ber. d. Senckenb. Naturf. Ges. 1886, p. 18.

Solarium perinum de Gregorio, 1890, p. 137, pl. 12, figs. 49-52.

Solarium supravenustum de Gregorio, 1890, p. 137, pl. 12, figs. 54-56, [pl. 17 error]; Dall, 1892, p. 330 [*Torinia*].

Solariella stalagmium (Conrad) Dall, 1892, pp. 330, 407.

Solariella elegans (Lea) Cossmann, 1893, p. 21.

Eumargarita elegans (Lea) Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 257. section *Periaulax* Cossmann.

Depressed, perlaceous, with two large crenulated striæ on each side whorl, and numerous smaller crenulated lines; volutions channeled at the suture; periphery obtusely rounded; beneath rounded with minute striæ, and irregular impressed lines diverging from the umbilical margin; umbilicus narrow; aperture large, orbicular.—[Conrad, 1833].

Discoidal, with two prominent crenulated striæ, and one or two intermediate obscure lines; area of the suture broadly furrowed; periphery rounded with regular revolving lines; base convex, with obsolete revolving lines, and distinct lines diverging from margin of the umbilicus; whorls within the umbilicus bicarinate, transversely striated; aperture nearly orbicular.

Syn. S. elegans, *Lea. Con. p.* 121, *pl.* 4, *f.* 109.

Locality.—Claiborne, Alab.

[51] Dall, W. H., 1892, p. 429.

[52] Woodring, W. P., 1928, p. 455, pl. 40, figs. 2, 3.

[53] Wood, S. V., Ann. and Mag. Nat. Hist., vol. 9, p. 531, 1842.

This is a common species, and the most beautiful fossil at Claiborne. No. 4, first ed. p. 44.—[Conrad, 1835].

Conrad's type collection consists of 6 specimens. The largest specimen is chosen as the lectotype.

Nucleus smooth, three whorls, large for the size of the shell; the nepionic whorls are shouldered and sculptured with longitudinal ribs which soon become nodose at the shoulder, with a furrow between the suture and the nodes; on about the beginning of the second nepionic volution, a second, crenulated, spiral line begins which extends over the remainder of the shell; the number of fine, spiral lines varies. There may be one or two, spiral threads between the two, large, crenulated ribs; spiral lines occur below the second, crenulated rib over the area of greatest convexity, becoming obsolete below to the immediate vicinity of the umbilicus, where several lines occur; crossing the spiral lines are short puckers radiating from the crenulated margin of the umbilicus; the young shells, less than two millimeters are smooth on the base and lack the spiral lines around the crenulated margin of the umbilicus. On the smooth area of the base many large specimens will show traces of spiral ribbing under the microscope. There are several shells in the series which have the entire surface of the body whorl covered with spiral lines. The other characters of the shell are typical. The spiral ribbing is clearly seen to be a developing character in the species. The bicarination of the umbilicus which Conrad described occurs in the young but with age more spiral lines develop until in some adult shells there are four or five, irregular in size and character.

Comparing figures of *Delphinula solaroides* Heilprin with young shells of *S. stalagmium* as well as immature specimens of the other Claibornian Solariellas, it is evident that Heilprin had a young shell. Heilprin's specimen is small, 2+ mm., greatest diameter, and has a smooth side and base. The holotype shows obscure, microscopic, spiral lines over the middle portion of the body whorl. This is the character of minute specimens of *S. stalagmium* so it seems reasonable as Meyer determined, that Heilprin had Conrad's species from "the sand". The smoothness of the sides are not typical however of the size of Heilprin's specimen. In a similar way, De Gregorio's *Solarium perinum* seems to be a poorly illustrated *stalagmium*. Dr. Dall made such an inclusion. Lea had a tiny specimen. His figure of *elegans* is superior to that of Conrad's figure of *stalagmium*.

Cossmann placed the species in his section *Periaulax*[54] of *Eumargarita* because *stalagmium* has a partially smooth base.

A section made on the "smooth character of the base" hardly covers the Claiborne species when it is distinctly seen on a suite of the species that the presence or absence of spiral lines on the base is not even of specific value but a matter of ontogenetic growth. There are specimens in the collection which show the inconstancy of the character. Particularly the lines are not of higher rank than specific, when one considers the entirely smooth variety of this species in the lower Claiborne. If the variety proves to be constant in its stratigraphic range, the phylogenetic character coincides with the ontogeny of the shell.

Conrad could well say that this species was "the most beautiful fossil at Claiborne." Worn surfaces inside and out reveal the nacreous interior.

Dimensions.—Height, 7 mm.; greatest diameter, 11 mm., lectotype. Height, 4 mm.; greatest diameter, 7 mm., lectotype *S. elegans* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; *S. elegans* Lea lectotype No. 5606, A. N. S., Holotype *D. solaroides* Heilprin, No. 10063/1 Hall Coll., Cat. No. 5536/1, American Museum of Natural History, New York, N. Y.

Occurrence.—Gosport sand: locality 104.

Solariella stalagmium modesta (Meyer and Aldrich) Plate 4, figs. 7, 11

Solarium elegans Lea var. *modestum* Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., vol. 9, No. 2, pp. 41, 47, pl. II, figs. 6, 6a.
Solariella stalagmium modesta (Meyer and Aldrich) Dall, 1892, pp. 331, 407.

Like Solarium elegans Lea from Claiborne, but without ornamentation, the row of tubercles along the suture excepted.
Wautubbee.—[Meyer and Aldrich, 1886].

The Harris collection contains a single specimen. In addition to the single row of tubercles mentioned by Meyer and Aldrich there are faint, spiral lines with wide interspaces on the dorsal surface of the whorls.

Dimensions.—Height, 5 mm.; greatest diameter, 8.5 mm., holotype.

[54] Cossmann, M., Soc. Roy. Mal. Belgique, tome XXIII, 4th ser. tome III, p. 62, 1888. Type *Solarium spiratum* Lamk.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Wautubbee, Miss.

Solariella cancellata (Conrad) Plate 4, figs. 9, 13, 17; Plate 78, fig. 13

Solarium cancellatum Conrad, 1833, Jan., Amer. Jour. Sci., vol. 23, p. 344 [error in locality]; Conrad, 1834, App. in Morton, p. 3, Conrad, 1835, p. 49, pl. 17, fig. 11; H. C. Lea, 1848, p. 106; d'Orbigny, 1850, p. 348; de Gregorio, 1890, p. 134, pl. 12, figs. 22-24; Harris, 1895, p. 9.
Solarium cancellatum Lea, 1833, Dec., p. 121, pl. 4, fig. 110.
Architectonica cancellata Conrad, 1865, p. 29; Conrad, 1866, p. 13.
Solariella cancellata (Conrad) Dall, 1892, pp. 331, 407; Cossmann, 1893, p. 21.
Eumargarita (*Solariella*) *cancellata* (Conrad) Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 261.

Shell elevated, cancellated; volutions angular, channeled at the suture; umbilicus cancellated; aperture orbicular. Length, one-fifth of an inch.

Locality.—Suffolk, Va.—[Conrad, 1833].

Subconical, cancellated; volutions with 3 prominent revolving carinæ, and channeled at the suture; base cancellated; umbilical margin carinated; whorls cancellated within the umbilicus; aperture suborbicular.

S. cancellatum, nob. American Journal of Science, v. 23, p. 344; Lea, Con. p. 121, *pl.* 4, *f.* 110.

Locality.—Claiborne, Alab.

In Silliman's Journal, I inadvertently named Suffolk in Virginia as the locality of this shell which occurs only at Claiborne. Mr. Lea claims not only the species but the name I had given it!—[Conrad, 1835].

Conrad's type collection consists of two specimens. The larger specimen is broken. The smaller is chosen as the lectotype.

The type of Lea is a worn specimen.

Nucleus large for the size of the shell, smooth, about three whorls; the post-nuclear whorls begin with the cancellate sculpture of the adult whorls; the base of the body whorl of young specimens, 1 to 1.5 mm. in diameter, is smooth with sharp crenulations around the margin of the umbilicus. With further growth fine, revolving and longitudinal lines begin over the basal area of the body whorl which result in the sharp cancellation of the base and interior of the umbilicus as well. The type shell of Lea's *cancellata* is an immature specimen, showing the initial stage of the basal lines. The whorls of the spire have three, prominent, spiral ribs, the number is increased with age on the body whorl and they are continuous over the base and throughout the umbilicus, thus retaining the cancellate sculpture over the entire surface. The shell is beautifully nacreous within, which gives a clue as to family relationship if the other characters of the shell might be misleading.

Dr. Dall listed the species from the Sabine at Woods Bluff, Ala. and the Jackson, at Jackson, Miss. Prof. Harris did not find it at Woods Bluff.

Dimensions.—Height, 4.5 mm.; greatest diameter, 4 mm.; lectotype. Height, 2 mm.; greatest diameter, 2.4 mm. lectotype *S. cancellatum* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. Lectotype, *S. cancellatum* Lea, No. 5614, A. N.S.

Occurrence.—Gosport sand: locality 104.

Solariella tricostata (Conrad) Plate 4, figs. 5, 8, 12; Plate 78, fig. 7

Solarium granulatum Lea, 1833, p. 122, pl 4, fig. 111; Conrad, 1834, App. in Morton, p. 3; H. C. Lea, 1848, p. 105; non *S. granulatum* Lamarck, 1845.
Solarium tricostatum Conrad, 1835, p . 50, pl. 17, fig. 10.
Solarium pseudogranulatum d'Orbigny, 1850, p. 349.
Architectonica pseudogranulata Conrad, 1865, p. 30; Conrad, 1866, p. 13.
Delphinula granulata (Lea) de Gregorio, 1890, p. 141, pl. 13, figs. 13, 14.
Liotia granulatum (Lea) Dall, 1892, pp. 331, 411.
Solariella tricostata (Conrad) Cossmann, 1893, p. 21.
Eumargarita (*Solariella*) *tricostata* (Conrad) Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 261.
Solarium tricostatum (Conrad) Harris, 1895, p. 7 and *granulatum*, p. 21.
? *Solariorbis bellum* Conrad in Harris, 1895, p. 7.

Shell conical, flattened below, with seven or eight transverse granulate lines, between which it is furnished with oblique striæ; substance of the shell thick; suture furrowed; umbilicus narrow, largely crenate without, striate within; whorls five; mouth nearly round, subangular above; outer lip crenate.

Length, .2, breadth, .2 of an inch.

The smaller figure is of the size of nature.

Observations.—This truly beautiful little species resembles more nearly a *Turbo* than either of the two last. The roundness of its mouth and the elevation of its spire would seem to forbid its being placed in the genus *Solarium*. Its crenulate umbilicus, its granulations, and its crenulate lip seem to make it necessary to place it here. It certainly resembles *S. variegatum*, but is more conical and has not so wide an umbilicus. I place it last of the genus, and it may be considered the connecting link with the *Turbones*.

— — — — — — — — — —[Lea, 1833].

The nucleus consists of about two, smooth whorls, depressed: the sculpture of the post-nuclear whorls begins with fine, longitudinal striations which increase in sharpness until on immature specimens they are conspicuous; on old specimens they are reduced and may become obsolete over most of the shell; the tricostate character of the shell consists of a revolving rib at the suture, one forming a shoulder and the third between the shoulder and the suture below; on the adult the revolving ribs become prominently nodose; the suture is impressed throughout; a fourth, nodose revolving rib forms the basal shoulder of the body whorl; there are usually three, fine, crenulated revolving ribs on the basal area of the body whorl, sometimes a finer thread occurs between the ribs; the umbilical margin is crenulated and a second, sharp, crenulated rib within the umbilicus; the umbilical opening is deep and narrow posteriorly, but flares widely to the margin at the first rib; the interior of the shell is nacreous.

Dr. Dall placed the species under *Liotia* Gray[55] but the species hardly seems to belong in that group since it lacks the thickened, outer lip and sunken spire.

Prof. Harris in his catalogue of '95, placed the "labelled specimen" of *Solariorbis bellus* Conrad as synonymous with *granulatum* Lea. The *S. bellus* Conrad is a nomen nudum, recorded by Conrad[56] only in his catalogues of 1865 and 1866 without description or figure.

Conrad stated definitely, in 1835, that the name *tricostatum* was a substitute for the preoccupied *granulatum*. His name therefore has priority over that of *pseudogranulatum* of d'Orbigny, 1850.

Dimensions.—Height, 6 mm.; greatest diameter, 6.5 mm.; lectotype *S. granulatum* Lea.

Lectotype.—No. 5619, Academy of Natural Sciences, Philadelphia, Pa. *S. granulatum* Lea.

Occurrence.—Lower Claiborne: localities 103, 136, 725, 731, Gosport sand: locality 104.

Solariella louisiana Dall Plate 4, figs. 1, 2, 3, 4, 10, 14

Solariella louisiana Dall, 1892, p. 407; Dall. 1898, pl. 23, fig. 1, 1a; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 100, pl. 12, fig. 18. Cossmann, 1918, Essais Pal. Comp., p. 261, *Eumargarita*.

Solariella sylværupis Harris, 1896, Acad. Nat. Sci. Phila., vol. 48, p. 477, pl. XXI, figs. 6, 6a.

Eocene of McKay's marl-bed, near Enterprise, Miss., and at Lisbon; in Alabama at Lower Peach Tree Creek, a branch of the Alabama River, Hatchetigbee Bluff, the lower bed at Wood's Bluff, and Butler, Choctaw Co.

Shell small, subconical, with five or six whorls; nucleus small; whorls rounded, with a flattened space in front of the suture, which is distinct and sometimes even slightly channelled; the flattened area is bounded anteriorly by an elevated spiral thread, which, especially on the earlier whorls, is more or less distinctly beaded; beside this the surface is sculptured with spiral grooves separated by about equal interspaces and crossed obliquely by numerous impressed lines, rather evenly spaced and in harmony with the lines of growth; the sculpture throughout is stronger on the upper part of the whorls and on the earlier whorls, on the last whorl it is more or less

[55]Gray, J. E., Syn. Brit. Mus., 44th ed., p. 57, 1842. (non 1840 see Iredale, T., Mal. Soc. Lond., Proc., 10, p. 306, 1913) no species designated; Gray, J. E., Proc. Zool. Soc. Lond., pt. 15, p. 145, 1847.

[56]Conrad, T. A., Amer. Jour. Conch., vol. 1, p. 30; de Gregorio, A., 1890, p. 141 as *Delphinula;* Dall, W. H., 1892, p. 411.

obsolete in nearly all the specimens; the periphery is evenly rounded; the base slightly flattened; the umbilicus large and funicular, its walls sculptured in both directions, the spirals distinctly beaded; the umbilical carina is crenate, with a narrow sulcus formed by two or three impressed lines, outside of the carina; aperture very oblique, rounded, thin-edged, hardly interrupted by the body-whorl or umbilical carina. Alt. of two specimens, A and B, A7, B5.5; max. diam. A8.5, B7.0 mm.

This species has been generally confounded with *S. elegans*, which is a less elevated shell with a scalar umbilicus and generally with several elevated, rather distant spirals and more prominent sculpture.—[Dall, 1892].

This species is equally abundant in the Sabine (Wilcox) and lower Claiborne Eocene. Dall lists Sabine and lower Claiborne localities in his original description and does not state from which locality his type was taken. An examination of the holotype at the U. S. National Museum revealed the specimen to be from McKay's marl-bed, Miss., lower Claiborne. Dall also includes the species from the lower Claiborne at Lisbon, Ala., as well as several Sabine (Wilcox) localities. The species is abundant at Woods Bluff, Ala.

The amount of spiral sculpture is not a constant character in this species. An examination of abundant material from the type locality reveals some specimens which have the body whorl smooth. Others have the body whorl completely ornamented with strong, spiral ribs. Material from Woods Bluff, Ala., Sabine Eocene shows the same variation of sculpture. Several specimens are herein figured to show this change of character.

Holotype.—No. 113078, U. S. National Museum.

Occurrence.—Sabine (Wilcox) Eocene: Lower Peach Tree, branch of Alabama R., Hatchetigbee, Woods Bluff, Butler and 4 mi. above Hamilton Bluff, Ala. Lower Claiborne Eocene: McKay's marl-bed, near Enterprise, Miss. (type) and Lisbon, Ala. (Dall).

Solariella fungina Cossmann Plate 5, fig. 18

Solariella fungina ? (Conrad) Cossmann, 1893, p. 22, pl. 1, fig. 26 non *Solarium funginum* Conrad, 1833, p. 44.

Ce n'est pas sans hésitation que je rapporte à l'espèce assez douteuse de Conrad, une jolie coquille dont la vue en plan ressemble assez exactement à la figure de *Solarium funginum;* malheureusement Conrad n'en a pas figuré la vue en élévation, de sorte qu'il y a un peu d'incertitude. C'est une coquille trochoïde, à spire étagée, composée de six tours nacrés sous l'épiderme, partagés en deux par un angle médian qui porte de fines crénelures, surtout dans les premiers tours, car elles disparaissent totalement sur le dernier; la région inférieure forme une rampe aplatie, avec un fin cordonnet circonscrivant la gouttiére suturale, les deux régions sont ornées de plis d'accroissement à peine visibles, trés serrés, obliques, qui produisent des crénelures obsolétes sur le cordonnet et sur l'angle median; le dernier tour est fortement caréne à la circonférence de la base, qui est us peu convexe, cerclée par quatre cordonnets concentriques décroissand de la caréne périphérique à caréne circa-ombilicale; ombilic largement ouvert en entonnoir, limité par un cordon saillant et finement crénelé, et portant beaucoup plus bas, sur sa paroi oblique, trois cordonnets rapprochés, rendus granuleux par l'intersection des plis d'accroissement. Ouverture ronde, à péristome continu, dans un plan trés incliné sur l'axe vertical, fortement nacrée à l'intérieur.

Diamètre, 4 mill.; hauteur, 3 mill.

LOC. Claiborne, un seul individu, ma coll. (pl. I fig. 26).—[Cossmann, 1893].

This species is a *Solariella* while the *Solarium funginum* Conrad is not. The latter is discussed under *Architectonica*. The name which Cossmann used, although he thought his species was the same as Conrad's, will stand for a distinct species because the generic combination was different.

Holotype.—Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Occurrence.—Gosport sand: Claiborne, Ala.

? Solariella aldrichiana (Harris) Plate 5, fig. 15

Gaza ? aldrichiana Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 84, pl. 9, fig. 14.

Size and general form as indicated by the figure; whorls 4; 1 minute, non-protruding; 2, 3 rather small and tumid, marked by a few radiating lines which extend from the suture downward about two-thirds across the whorls, reminding one somewhat of the upper surface of *Solarium bellastriatum;* body whorl rather large, rounded, slightly flattened above, with indistinct radial lines or lines of growth, flattened slightly below, rugose near the umbilicus; umbilicus small, Solarium-like rendered somewhat hexagonal by the protruding peripheral dentes; mouth round; shell rather thick; general appearance like *Dillwynella naticoides.*

Locality.—Elm Creek, Lee Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Aldrich's collection.—[Harris, 1895].

The name *Solariella* is suggested for this unique specimen in place of *Gaza* as the "Solarium-like" umbilicus seems to fit the former genus better. The shells of both genera are nacreous. The description of *aldrichiana* does not state the nature of the shell structure. *Gaza* has a reversed thickened lip, a twisted pillar, angulated in front, parted from the lip behind and spread out in a nacreous callus in the umbilical region. The crenate margin of the umbilicus in *aldrichiana* is more like the subgroups of *Gaza*[57], *Callogaza* and *Microgaza* of Dall[58]. *Callagaza* has an

[57]Watson, R. B., Jour. Linn. Soc., vol. XIV, p. 601, 1879 genotype by original designation, *G. dædala* W.; Watson, R. B., Challenger Rept., Gastr., vol. XV, p. 93, pl. VII, fig. 12, 1885.

[58]Dall, Wm. H., Bull. Mus. Comp. Zool., vol. IX, p. 49, 1881 *Callogaza*; Dall, Wm. H., ibid, vol. XVIII, p. 356, [type designated *C. watsoni* Dall]. 1889; Dall, Wm. H., ibid, vol. IX, p. 50, 1881, *Microgaza* monotype *M. rotella* Dall; Dall, Wm. H., ibid, vol. XVIII, p. 357, 1889.

umbilical callus extending from the inner lip and *Microgaza* has an angulated peristome.

Dimensions.—Height, 4 mm., greatest diameter, 4 mm. holotype.

Holotype.—Geology Department Johns Hopkins University, Baltimore, Maryland.

Occurrence.—Lower Claiborne: Elm Creek, Lee Co., Texas (Aldrich).

Genus **NORRISIA** Bayle, 1880[59]

(*Trochiscus* Sowerby, 1838[60] nec Heyden, 1826 nec Held, 1857).

Genotype by original designation *Trochiscus norrisi* Sowerby. Living. Monterey, California to Lower California.

Norrisia nautiloides (Aldrich) Plate 5, figs. 11, 17, 24

Chlorostoma nautiloides Aldrich, 1911, Bull. Amer. Pal., vol. 5, No. 22, p. 12, pl. V, figs. 4, 5, 6.

The Aldrich type collection consists of two specimens. An adult has spiral striations over all of the whorls but a young specimen does not show the spiral striations over the whole of the dorsal area of the body whorl.

The species is strikingly typical in shape, umbilicus and aperture of *Norrisia*. The type species of *Norrisia* is smooth. Young specimens have faint, spiral striations on the whorls of the spire. This species of course does not compare in size to the type of *Norrisia*.

Dimensions.—Height, 1.5 mm.; greatest diameter, 5 mm.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala.

Subgenus **NORRISELLA** Cossmann, 1888[61]

Genotype by original designation *Norrisella pygmæa* (Desh.) Eocene. Paris Basin.

Norrisia (Norrisella) nitens (Lea) Plate 5, figs. 32, 33

Turbo nitens Lea, 1833, p. 125, pl. 4, fig. 115; H. C. Lea, 1848, p. 106; Harris, 1895, p. 30.

[59]Bayle, E., Jour. de Conch., vol. 28, p. 241, 1880 renamed the preoccupied *Trochiscus* Sowerby, 1838.

[60]Sowerby, G. B., Mag. Nat. Hist., vol. II, n. ser., p. 96, 1838; figured in Tryon, Man. Conch., vol. 11, p. 274, pl. 61, fig. 30.

[61]Cossmann, M., Ann. Soc. Roy. Mal. Belg., IV ser., Tome XXIII, p. 58, 1888.

Solariorbis nitens (Lea) Conrad, 1865, p. 30; Conrad, 1866, p. 14.
Delphinula nitens (Lea) de Gregorio, 1890, p. 141, pl. 13, fig. 12.
Calliostoma nitens (Lea) Dall, 1892, pp. 400, 412, pl. 22, fig. 30.
Tiburnus nitens (Lea) Cossmann, 1893, p. 21; Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 250; [partim].

Shell rather depressed above, flattened below, polished; substance of the shell thick; suture linear; umbilicus rather large and round; whorls four; mouth suborbicular, outer lip edged; thickened at its superior junction with the whorl.

Length, 3-20ths, breadth, 5-20ths, of an inch.

Observations.—Smaller than the above, [*T. naticoides*] this species has some resemblance to it. It differs in being a flatter shell, in being highly polished, and in having the outer lip thickened where it is in contact with the whorl. Immediately below the umbilicus there is usually a slight impression on the lip.—[Lea, 1833].

The nucleus of the species is like that of *Tiburnus eborea* (*naticoides*). Lea pointed out the differences between this species and *Tiburnus eborea* to which should be added that of the shell. *N. nitens* has a beautiful, nacreous character which is conspicuous on any specimen either from the surface of the aperture or by any break of the surface of the shell. *T. eborea* shows no evidence of nacre even when the surface of the shell is deeply eroded. It is on the differences of the last character that the two forms may be easily and definitely separated, though they might be confused by a general similarity in shape.

Cossmann did not have this form clearly in mind when he placed the "*Trochus planulatus*" H. C. Lea as synonymous. H. C. Lea's figure is ambiguous but the shell of *planulatus* has the body whorl carinated. *N. nitens* has the body whorl broadly angulated but not carinated even in the young stages.

Cossmann formed a subgenus for a Paris Basin species which he believed had a relationship with that unique Trochid *Norrisia norrisi* (Sowerby) of the California Coast. The relationship seems to be close, particularly in the case of *nitens.* There is a remarkable parallelism in the shape and character of *Norrisia norrisi* and *nitens.* In *norrisi* the columellar protuberance or lump seems to be formed on the callus of the inner lip while in *nitens* it is actually formed on the margin of the umbilicus just back of and crowding into the callus. Cossmann described a species from the Gosport sand, *N. micromphalus* (*Gibbula*). I have not found Cossmann's species but *Turbo nitens* is extremely like the group. The protuberance of the columella varies in size. Some specimens of *T. eborea* Conrad (*naticoides* Lea) show a tendency toward developing a similar prominence on the pillar but it is never developed to the extent as it is in *nitens.*

Dimensions.—Height, 4 mm.; greatest diameter, 5 mm. Lectotype.

Lectotype.—No. 5648, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Norrisia (Norrisella) micromphalus (Cossmann) Plate 5, figs. 35, 36

Gibbula micromphalus Cossmann, 1893, p. 21, pl. I, figs. 24, 25.
Norrisia (*Norrisella*) *micromphalus* Cossmann, 1918, Essais Pal. Comp. 11 liv., p. 247.

Testa minuta, spira depressa; anfractibus 4, sutura, profunda ac lineari discretis, striis obliquis divaricatis, cum striis incrementi elegantiter clahratis, ornatis; ultimo anfratu ad peripheriam rotundato, basi mediocriter convexa, concentric ac obsolete lirata; umbilicus parvus ex quo surgit funiculus callosus, ad aperturam dilatatus (?).

Petite coquille a spire déprimée, non saillante, composée de quatre tours, croissant, régulièrement séparés par une suture linéaire mais profonde; ornementation formée de stries obliques, divariquées, croisant presque à angle droit les stries d'accroissement qui sont elles mêmes très inclinées; dernier tour grand, peu élevé, arrondi à la périphérie de la base qui est médiocrement convexe, perforée, d'un ombilic étroit, d'où sort un funicule calleux; l'ouverture etant brisée sur mon unique exemplaire, je ne puis que supposer, sans l'avoir vérifié, que ce funicule s'étale comme dans les *Monilea,* et aboutit à l'extrémité antérieure de la columelle.

Cette petite coquille s'écarte tellement des autres petites espèces turbiniformes de Claiborne, que je n' hésite pas à la décrire, surtout à cause de son ornementation qui rappelle celle de *G. mitis* et *mirabilis,* du bassin de Paris; mais elle a la spire beaucoup moins allongé que ces deux espéces, et presque aplatie au sommet.

LOC. Claiborne, ma coll. (pl. I, figs. 24-25).—[Cossmann, 1893].

Cossmann considered this species to be of the same nature as several species of the Eocene, mostly Lutetian, of the Paris Basin, bearing relationship with the Recent form of the West Coast of North America, *Norrisia.*

Holotype.—Cossmann collection Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Occurrence.—Gosport sand: Claiborne, Ala.

Cf. Norrisia (Norrisella) parva (H. C. Lea) Plate 78, fig. 3

Turbo parvus H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 95, pl. 1, fig. 8; H. C. Lea, 1848, p. 106; de Gregorio, 1890, p. 143, pl. 13, figs. 32, 33.

T. testâ conicâ, ventricosâ, umbilicatâ, crassissimâ, lævi, politâ; umbilico parvo; anfractibus quaternis, planulatis; suturis impressis; aperturâ rotundâ.

Shell conical, ventricose, umbilicate, very thick, smooth, polished; umbilicus small; sutures impressed; whorls four, flat; mouth round.

Length .07. Breadth .05 of an inch.

Remarks.—This little species has no remarkable characters, but I cannot identify it with any described species. It somewhat resembles *T. naticoides,* Lea, but its greater elevation and small mouth, besides its not being so large, readily distinguish it from that species. I regret that from my single specimen having the mouth broken, I cannot determine whether it has the outer lip reflexed.—[H. C. Lea, 1841].

This species is known only from the holotype. The shell appears to be slightly nacreous. The species is not a *Turbo*. It is minute and probably a young stage of a species. It is more elevated than *Norrisella* s. s. It approaches in shape *Norrisella munda* (Deshayes) an elevated species which Cossmann[62] placed in the subgenus.

Dimensions.—Height, 1.5 mm.; greatest diameter, 1 mm.

Holotype.—No. 13170, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

"Trochus" gumus de Gregorio Plate 5, figs. 8, 12, 13

Trochus (*Oxystele*) *gumus* de Gregorio, 1890, p. 144, pl. 13, figs. 34-36.

Testa imperforata, subturbiformis, sublaevigata, subconoidea; spira convexa, paucispirata; ultimo anfractu ad peripheriam subangulato, basi convexo subconoideo; apertura lata. L. 7 mm.

C'est une petite espèce avec des singuliers caractères mais dont je doute un peu de la provenance.—(Coll. mon Cabinet).—[De Gregorio, 1890].

This species is known only by De Gregorio's description and figure. It is not a typical *Trochus* and would belong to a subgroup which lacks a tooth or notch on the columella.

Holotype.—De Gregorio home Via Molo 132, Palermo, Sicily.

Occurrence.—Gosport sand: Claiborne, Ala. (De Gregorio).

"Delphinula concionaria" de Gregorio Plate 5, fig. 31

Delphinula concionaria de Gregorio, 1890, p. 142, pl. 13, fig. 30.

?*Collonia concionaria* (de Gregorio) Cossmann, 1893, p. 22, pl. I, fig. 23.

Delphinula conscionaria Dall, 1892, p. 411.

De Gregorio pointed this specimen out as a doubtful species. One cannot suggest what it might be unless it is a young specimen of *Tiburnus eborea* (*naticoides*) on which the margin of the aperture and callus are broken back. Such a mutilation to that species gives somewhat the same appearance as De Gregorio's figure. The shell was certainly not worthy of a name. Such specimens can be figured and attention drawn to the interesting features without encumbering literature with useless names.

Cossmann's further illustration of a specimen suggested as the same does not seem to be what De Gregorio had. Cossmann's shell is not renamed until more is learned of it.

[62]Cossmann, M. and Pissarro, G., Iconographie Complète etc., tome 2, pl. IV, fig. 25-2, 1910-1913.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Gosport sand: Claiborne, Ala.

The *Rotella nana* of Lea, 1833, p. 214, was described by Lea from the St. Mary's Miocene, Maryland. Conrad (*Umbonium nanus*) in error included the species in his 1865, p. 34, and 1866, p. 11, Eocene catalogues. De Gregorio, 1890, p. 140, following Conrad listed the species from Claiborne.

Family CYCOSTREMATIDÆ

Genus TUBIOLA A. Adams, 1863[63]

Genotype by subsequent designation, Bush, 1897[64], *T. cornuella* Adams. Living. Korea.

Tubiola nautiloides (Aldrich) Plate 5, figs. 4, 9, 10

Adeorbis ? nautiloides Aldrich, 1910, Nautilus, vol. XXIV, No. 7, p. 73, pl. IV, figs. 3, 4, 5.

Shell very small, substance rather thin; whorls three, expanding rapidly. The body whorl separating and extending beyond the other whorls; surface smooth except near the aperture where a few growth lines become coarser; umbilicus small. The figure does not show the separation of the whorls well.

Longest diam. about 2 mm.

Locality.—De Soto, Miss. Claibornian.

Remarks.—This singular little species is doubtfully placed in *Adeorbis.* It might just as well be put in *Valvata.* It is hardly an embryonic shell, but in any event it is an interesting development wherever it really belongs.—[Aldrich, 1910].

This species has the smooth, loosely coiled whorls with the body whorl enlarged and extended, of *Tubiola.* The peristome is continuous. This Eocene form seems to have the body whorl extended more than the few living species of the genus.

The dorsal and umbilical appearance of the shell resembles *Choristes elegans* var. *tenera* Verrill[65]. That species does not have the whorls loosely coiled nor the body whorl extended.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Claibornian Eocene; De Soto, Miss. (type). Lower Claiborne: locality 728.

Genus TEINOSTOMA H. and A. Adams, 1853[66]

Genotype by subsequent designation, Cossmann[67], 1888, *Tinostoma* [=*Teinostoma*] *politum* A. Adams. Living. Philippines.

[63] Adams, A., Proc. Zool. Soc. Lond., p. 74, 1863.

[64] Bush, K. J., 1897, p. 109.

[65] Verrill, A. E., Conn. Acad. Arts and Sci., Trans., vol. VI, p. 256, pl. XXIX, figs. 9, a, b, 1884.

[66] Adams, H. and A., 1853, vol. 1, p. 122.

[67] Cossmann, M., Ann, Soc. Roy. Mal. Belgique, tome XXIII, p. 44, 1888.

Teinostoma texanum, new species Plate 2, figs. 20-22

Shell medium, about 3½ whorls not enveloped and not elevated; sides of body whorl rounded; umbilicus covered completely with a solid callus; surface smooth.

This species differs from the following Teinostomas in having the whorls of the spire more exposed. It as well as *T. harrisi* has the surface of the shell entirely smooth except for lines of growth. *T. texanum* is larger than *harrisi.*

Holotype.—No. 2658, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 723.

Section **IDIORAPHE** Pilsbry, 1922[68]

Type by original designation, *Teinostoma angulatum* Gabb. Miocene. Santo Domingo.

Teinostoma angulare Meyer Plate 2, figs. 29, 30

Teinostoma angularis Meyer, 1885, Amer. Jr. Sci., vol. XXIX, No. 174, 3d. ser., p. 463; Meyer, 1886, Ala. Geol. Sur., Bull. No. 1, pt. II, p. 66, pl. 1, figs. 9, 9a.
Umbonium angularis (Meyer) de Gregorio, 1890, p. 140, pl. 13, figs. 28, 29.
Teinostoma angulare (Meyer) Dall, 1892, p. 412 section *Pseudorotella*.
Tinostoma angulare (Meyer) Cossmann, 1893, p. 21

Lenticular; whorls three, rapidly increasing in size, last whorl carinated; base slightly convex, nearly flat; columellar part thickened; mouth rhombical. On both sides of the carina several impressed spiral lines crossed by very minute radiating striæ. Last whorl with an indistinct spiral fold near the suture.

Locality.—Claiborne, Ala.—[Meyer, 1886].

This species as well as *T. subrotundum* Meyer which was placed under *Pseudorotella* Fischer[69] by Dall does not belong to that division which has the spire uncovered. The two species with *T. harrisi*, n. sp. as well as *T. verrilli* Meyer of the Jackson Eocene have the whorls of the spire enveloped to the extent of *Teinostoma* section *Idioraphe* Pilsbry. These species do not have the aperture "greatly produced and elongated, ending anteriorly in a slightly canaliculated point"[70] as was described for the genus. Such a character has been doubted[71] as pertinent to the generic description. The type of *Teinostoma* is a fairly large shell, equaling in size the Solariellas while the Eocene Teinostomas are tiny. There is

[68]Pilsbry, H. A., 1922, p. 398.
[69]Fischer, Paul, Jour. de Conch., vol. VI, p. 52, 1857 monotype *Rotella semistriata* d'Orbigny. Living. West Indies.
[70]Adams, H. and A., 1853, vol. 1, p. 123.
[71]Bush, K. J., 1897, p. 117.

considerable variation in the amount to which the apex is covered. This is proven by an examination of a suite of specimens of *T. verrilli* Meyer. Some specimens have the apical whorls enveloped so that only the minute point is seen, while others may have the whole of the protoconch exposed. The envelopment is greater with the age of the shell.

Dimensions.—Greatest diameter, 2+ mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne. Ala.

Teinostoma subrotundum Meyer Plate 2, figs. 31, 32

Teinostoma subrotunda Meyer, 1885, Amer. Jour. Sci., vol. XXIX, No. 174, p. 463; Meyer, 1886, Geol, Sur. Ala., Bull. No. 1, pt. II, p. 66, pl. 2, figs. 26, 26a; nec Van Winkle, 1919, Bull. Amer. Pal., vol. VIII, No. 33, p. 12 nec Van Winkle, 1921, ibid, vol. VIII, No. 36, p. 8.

Teinostoma subrotundum (Meyer) Dall, 1892, p. 412 section *Pseudorotella.*

Discoid; margin rounded; umbilical region covered and thickened by callus; whorls four, rapidly increasing in size; smooth, except some faint revolving lines; suture indistinct; aperture quadrate-elliptical.

Locality.—Claiborne, Ala.—[Meyer, 1886].

The holotype is broken on the margin. Fine, spiral lines occur just above the suture. They show on the middle convex area of the body whorl.

Dimensions.—Greatest diameter, 2 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala.

Teinostoma harrisi, new species Plate 2, figs. 27, 28

Teinostoma subrotunda (Meyer) VanWinkle, 1919, Bull. Amer. Pal., vol. 8, No. 33, p. 12; Van Winkle, 1921, ibid, vol. 8, No. 36, p. 8 non *T. subrotunda* Meyer, 1886.

Shell minute, solid; umbilicus entirely covered but not broadly spread with a thick pad; flattened above, margin rounded; aperture rounded; surface entirely smooth; spire enveloped.

Species known by two syntypes. One has the spire enveloped with only the minute apex showing. The other has had a portion of the enveloping whorls worn back showing most of the spire.

When the material from Newcastle, Va., was first studied this species was identified doubtfully as the *T. subrotundum* Meyer. The Virginia species differs from *T. subrotundum* in being entirely smooth.

Named in honor of G. D. Harris who collected the material in which the type specimens were found.

Syntypes.—Nos. 2656, 2657, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 843.

Genus **LYDIPHNIS** Melvill, 1906[72]

Genotype by original designation *Cyclostrema euchilopteron* Melvill and Stanton. Living. Gulf of Omar.

The angulated east American species which Bush[73] placed in *Circulus* have been included in the genus *Lydiphnis* Melvill by Johnson[74], raising the name to generic rank.

Lydiphnis novi-castri (VanWinkle) Plate 2, figs. 4, 5

Adeorbis novi-castri VanWinkle, 1919, Bull. Amer. Pal., vol. 8, No. 33, p. 9, pl. 1, figs. 11, 12.

A remarkable similarity is seen between this species and the recent *Lydiphnis trilix* (Bush)[75] of the Atlantic Coast from Massachusetts to Hatteras and Cedar Keys. The living species appears to be elevated more than the Eocene species but the apical whorls on *novi-castri* are broken so that the spire is elevated more than the illustration indicates. The latter half of the basal carina on the volution of the body whorl under the microscope shows a bifid character. The Miocene representative of the *trilix* development is *Lydiphnis pentagonus* (Gabb).[76] from Santo Domingo. That species seems to have stronger, spiral lines in the umbilical area.

In shape and carination *L. novi-castri* is like *L. Smithi* (Bush) (= *Cyclostrema tricarinata* Smith non *Adeorbis tricarinatus* S. V. Wood[77]), Recent, West Africa. The African species differs by having the whole surface of the shell ornamented with revolving striations.

Dimensions.—Height, 1 mm.; greatest diameter, 2 mm., holotype.

[72]Melvill, J. Cosmo, Mal. Soc. Lond., Proc. vol. 7, p. 25, 1906.

[73]Bush, K. J., 1897, pp. 125-127.

[74]Johnson, C. W., Boston Soc. Nat. Hist., Proc. vol. 40, No. 1, p. 76, 1934.

[75]Bush, K. J., Expl. Albatross, Rept. U. S. Fish. for 1883, p. 584, 1885 as *Skenea trilix;* Bush, K. J., 1897, p. 127, pl. XXII, figs. 6, 10, 10a, 12, a-g; plate XXIII, figs. 10, 15, as *Circulus.*

[76]Gabb, Wm., Trans. Amer. Phil. Soc., n. s. vol. 15, p. 243, 1873; Woodring, W. P., 1928, p. 441, pl. 37, figs. 16, 17, 18.

[77]Smith, E. A., Proc. Zool. Soc. Lond., p. 737, pl. 75, fig. 26, 1871; Tryon, G., Man. Conch., vol. X, p. 93, pl. 32, figs. 66-68, 1888; Bush, K. J., 1897, p. 126 new name.

Holotype.—No. 1399, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 843.

Genus **SOLARIORBIS** Conrad, 1865[78]

Genotype by subsequent designation, Dall[79], 1892, *Delphinula depressa* Lea. Claibornian Eocene. Southern United States.

? Solariorbis planulatus (H. C. Lea) Plate 78, fig. 4

Trochus planulatus H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, p. 96, pl. 1, fig. 9; H. C. Lea, 1848, p. 106.

Turbo (*Tiburnus*) *planulatus* (H. C. Lea) de Gregorio, 1890, p. 143, pl. 13, figs. 18-19.

Teinostoma planulatum (H. C. Lea) Dall, 1892, p. 414 section *Solariorbis.*

Tiburnus nitens Cossmann, 1893, p. 21 [partim]; Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 250.

T. testâ lenticulatâ, sub-crassâ, lævi, politâ; anfractibus quaternis, convexis; ultimo anfractu acutè carinato; suturis parvis; umbilico magno; aperturâ ellipticâ.

Shell lenticular, somewhat thick, smooth, polished; whorls four, convex; last whorl acutely carinated; sutures small; umbilicus small; mouth elliptical.

Length .05. Breadth .1 of an inch.

Remarks.—It is with considerable doubt that I have placed this shell in the genus Trochus, to which it seems, however, to belong, from the absence of crenulations on the umbilicus, which is not as large as in most Solariæ to which this shell would, at first sight, be referred. Its mouth, however, is perfectly elliptical, which seems to indicate a connection with the Turbo, to which, indeed, it bears a considerable affinity. It is remarkable as being the first Trochus observed in the deposit at Claiborne.—[H. C. Lea, 1841].

Specimens of this species have not been found since the original discovery. Dall[80] suggested that *S. subangulatus* (Meyer)[81] might be a synonym.

Dimensions.—Height, 2.5 mm.; greatest diameter, 1.5 mm., holotype.

Holotype.—No. 13171, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Solariorbis rotulus (Heilprin) Plate 78, figs. 15, 16

Teinostoma rotula Heilprin, 1879, Acad. Nat. Sci. Phila., Proc. vol. 31, p. 211, pl. 13, fig. 1.

Shell orbicular, depressed; polished; whorls three, bodywhorl with an impressed line immediately below the suture; umbilicus small, surrounded by a broad callous area; aperture nearly circular: inner lip expanded into a callus near the umbilical region.

Diameter .2 inch.

Claiborne, Alabama.

[78] Conrad, T. A., 1865, p. 30.

[79] Dall, W. H., 1892, pp. 412, 414.

[80] Dall, W. H., 1892, p. 414.

[81] Meyer, O., Ala. Geol. Sur., Bull. No. 1, pt. II, p. 67, pl. 2, fig. 28, 1886 as *Adeorbis.*

This is the first species of *Teinostoma* described as such existing in the Eocene formations of the United States. Mr. Lea's *Rotella nana* (*Umbonium*, Conrad), also from Claiborne, which I have not had an opportunity to examine, may prove to be a *Teinostoma*.—[Heilprin, 1879].

The species is known only by the holotype which has been examined. There is a pronounced, impressed groove below the suture, with the margin below the suture conspicuous. The body whorl is smooth but the surface of the spire has microscopic, spiral, punctate lines. Such lines appear obscurely around the margin of the umbilicus. The expansion of the inner lip is the termination of an obscure umbilical rib. The spire is slightly convex.

This species has been considered the same by authors as the *S. depressus* (Lea). Prof. Harris[82] examined the type of *S. depressus* in the late 90's and believed *S. rotulus* to be a smooth variety of *depressus.*

Because of certain differences the two species are retained herein as distinct. The obscure, spiral striæ on the base of *S. rotulus* occur on the umbilical callus. The basal, spiral striations on *S. depressus* are conspicuous under the lens and occur on the middle to the periphery of the body whorl and not on the umbilical callus. The two species are discussed under *S. depressus.*

Dimensions.—Height, 1+ mm.; greatest diameter, 4 mm., holotype.

Holotype.—No. 10067/1, Hall collection; No. 5571/1[83], American Museum of Natural History, New York, N. Y.

Occurrence.—Gosport sand: Claiborne, Ala.

Solariorbis depressus (Lea) Plate 2, figs. 6-8; Plate 78, fig. 14

Delphinula depressa Lea, 1833, p. 118, pl. 4, fig. 105; H. C. Lea, 1848, p. 99; de Gregorio, 1890, p. 140, pl. 13, figs. 8-9; Harris, 1895, p. 15.

Solariorbis depressus (Lea) Conrad, 1865, p. 30; Conrad. 1866, p. 13; Dall, 1892, p. 414 [under *Teinostoma*]; Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 88, pl. II, figs. 70-72 [as *planum* in explanation of plates] [under *Tinostoma*]; Woodring, 1928, p. 443.

Collonia depressa (Lea) Cossmann, 1893, p. 22, pl. II, fig. 27.

Teinostoma regularis Aldrich, 1921, Bull. Amer. Pal., vol. 9, No. 37, p. 12, pl. 1, figs. 21-22.

Shell sublenticular, polished, obsoletely and transversely striate, substance of the shell thick; spire, depressed; suture slightly impressed; umbilicus rather small, thickened and wrinkled at the edge; whorls three; mouth subelliptical.

[82]Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 102, 1899.

[83]Whitfield, R. P. and Hovey, E. O., Bull. Amer. Mus. Nat. Hist., vol. XI, pt. IV, p. 456, 1901.

Length nearly .1. Breadth .2 of an inch.

Observations.—Of this curious and interesting little species, I have procured but a single specimen. Its smoothness and general form are very unusual in this genus. Its lenticular form causes the mouth to be somewhat oval. A small portion only of the lip is perfect, and it seems to be thickened and somewhat reflected.—[Lea, 1833].

Shell small, depressed; nuclear whorls minute, smooth, depressed; base of shell flattened parietal callus thin; area back of and including the inner lip thickened, projects thumblike over the umbilical area and might in some cases obscure the umbilical opening; considerable variation occurs in the size of the umbilical callus, from a slight thickening to that of about half closing the umbilicus; umbilicus small with the sides smooth and sloping; medial basal area ornamented with several, punctate, spiral lines; upper surface of the shell wholly or partially covered with similar lines.

The holotype has fine, punctate, spiral lines over the whole dorsal surface.

The *Teinostoma rotula* Heilprin was listed by Meyer[84] as being the same as *S. depressus.* The specimen of Heilprin's seems to belong to the same genus but the body whorl of Heilprin's shell is entirely smooth. Since the shell is the same size as that of Lea, .2 inch, diameter, the difference cannot be accounted for by difference in age. Typically the sculpture occurs on the first stages of growth of the post-nuclear whorls. Three specimens in the Harris collection 5 mm., 3.5 mm., and 3 mm., in diameter, respectively, representing older shells than the type of the species, are far from being entirely smooth. Unfortunately the collection lacks a suite of specimens to show a variation in the character of the shell. The type species apparently attains a comparatively large size for this group of shells. It approaches *Solariella* in size.

"Adeorbis" quadrangularis Meyer[85] belongs to this group. Meyer's figure is a bit misleading as to the basal sculpture. There may be more spiral lines and the most posterior line occurs on a more sharply angulated margin than the illustration shows.

The specimens of *Teinostoma regularis* described by Aldrich are apparently *Solariorbis depressus.* The measurements of each are the same and the sculpture of each is similar.

Teinostoma microforatis Dall[86] from the Chipola Miocene,

[84]Meyer, O., Bericht, Senck, natur. Gesell., p. 18, 1887; Dall, W. H., 1892, p. 414.

[85]Meyer, O., Bericht, Senck. natur. Gesell., p. 4, 1, figs. 1, 1a, 1887. Jackson Eocene.

[86]Dall, Wm., 1892. p. 415, pl. 23, figs. 9, 10.

seems to represent a *Solariorbis* of the extreme form with the umbilicus nearly closed.

Dimensions.—Height, 2.5 mm.; greatest diameter, 4.5 mm., holotype.

Holotype.—No. 5589, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality 707. Gosport sand: locality 104 (type); Pugh's Branch of Satilpa Creek, Clark Co., Ala. (Aldrich, *S. regularis*).

Solariorbis depressus variety

A single specimen found in material from the lower Claiborne at Lapiniere Landing, Ouachita River, La., is smaller than typical *S. depressus* Lea from the Gosport sand. It may be a young specimen although its characters seem mature. It is similar to *S. depressus* in shape and has on the ventral surface, from the middle line to the periphery of the body whorl, revolving lines as in *S. depressus.* The peristome is thin and not thickened by an umbilical callus. There is a thin, parietal callus. The upper surface is smooth but on a portion of the penultimate whorl minute, punctate, spiral lines occur. Such sculpture suggests that, which in later development of *S. depressus* becomes conspicuous.

Since but a single though perfect specimen was available, a new name is not applied. The specimen was broken in photographing. It is No. 2653, Paleontological Research Institution.

Dimensions.—Greatest diameter, 3 mm.

Genus **CIRCULUS** Jeffreys, 1865[87]

Genotype by monotypy *Delphinula Duminyi* Requien [= *Valvata striata* Phillippi][88]. Living. Sicily to Ireland. Fossil.

Circulus Jeffreys, 1865 is used for *Adeorbis* Wood [partim]. *Adeorbis* Wood, 1842, became restricted to its subsequent type designation by Gray, 1847[89]. *Adeorbis* Wood has been shown to be synonymous with *Tornus* Turton and Kingston, 1830. For the detailed history of these changes see Bush[90] and particularly Iredale[91].

[87]Jeffreys, J. Gwyn, British Conchology, vol. III, p. 315, 1865, [fide Woodring, W. P., 1928, p. 438]; Jeffreys, J. Gwyn, ibid, vol. V, pl. 62, fig. 5, 1869.

[88]Harmer, F. W., Pal. Soc., vol. 75, The Pliocene Mollusca, vol. II, pt. III, p. 759, pl. LX, fig. 25, 1923. For synonymy and stratigraphic range.

[89]Gray, J. E., 1847, p. 146.

[90]Bush, K. J., 1897, p. 102.

[91]Iredale, T., Mal. Soc. Lond., Proc., vol. 9, p. 259, 1911; Iredale, T., ibid, vol. 11, p. 171, 1914.

"Circulus" sotoensis (Aldrich) Plate 5, figs. 16, 20, 27

Adeorbis sotoensis Aldrich, 1910, Nautilus, vol. XXIV, No. 7, p. 74, pl. IV, figs. 7, 8, 9.

Shell small, whorls five; spire pointed, smooth; whorls covered with spiral lines which are nearly obsolete just below the suture, growing more prominent on the body whorl as they approach the periphery. The effect is to make a broad, nearly smooth band on the whorls to the eye; under a glass this space shows exceedingly fine spirals. Body whorl strongly keeled, base smooth, umbilicus moderate. Aperture ovate. Diameter a little less than 2 mm.

Locality.—De Soto, Miss., just above the *Ostrea sellæformis* bed. Claibornian.—[Aldrich, 1910].

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Claibornian: De Soto, Miss.

Circulus exacuum (Conrad) Plate 5, figs. 28, 34, 37

Solarium axacuum Conrad, 1833, Nov., p. 44 [error in spelling].

Delphinula plana Lea, 1833, Dec., p. 117, pl. 4, fig. 104; H. C. Lea, 1848, p. 99.

Solarium exacuum Conrad, 1835, p. 48, pl. 17, fig. 5; H. C. Lea, 1848, p. 105; de Gregorio, 1890, p. 135, pl. 12, figs. 33-39 non 40-41; Harris, 1895, p. 19.

Architectonica exacuua Conrad, 1865, p. 29; Conrad, 1866, p. 13.

Architectonica plana (Lea) Conrad, 1865, p. 13.

Adeorbis exacua (Conrad) Dall, 1892, pp. 331, 344, 347.

Adeorbis exacuus (Conrad) Cossmann, 1893, p. 25; Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 98.

Solarium exacutum d'Orbigny, 1850, p. 348.

Discoid, with revolving acute lines; whorls with a wide indentation at the suture; submargin widely indented, and the periphery acutely carinated; beneath flattened; umbilicus smooth; aperture subovate.—[Conrad, 1833].

Discoid, with smooth, regular revolving striæ; area of the suture broadly furrowed; periphery carinated; margin rounded above, striated; base nearly flat, with a slightly submarginal furrow, obscure revolving striæ, and transverse wrinkles; margin of the umbilicus carinated.

Syn.—Delphinula plana, *Lea, Con. p.* 117, *pl.* 4, *f.* 104.

Locality.—Claiborne, Alab.

This elegant species resembles a *Valvata* with a depressed spire. Rare. No. 4, first, ed. p. 44.—[Conrad, 1835].

The Conrad type material consists of 4 specimens pasted on a card. The type is the first on the right.

The nucleus consists of about three, smooth, elevated whorls, the last whorl enlarged and expanded. The post-nuclear whorls begin with three, spiral ribs but there is a difference in the acceleration in the growth of the ribs so that two types of shell are seen when examining the shells under the microscope. One variation retains the three spiral lines with a fourth over the last part of the spire. Accompanying this feature will be a wider, sutural furrow and more depressed spire. The other type, comparing shells of the same stage of development, has a larger number of spiral ribs, with not more than six over the last of the spire. The furrow is slighter and the whorls are more rounded and elevated. These differences do not seem to be great enough to be of specific or varietal rank.

Circulus delphinuloides (Meyer)[92] of the Jackson has been confused with this species. They belong to the same genus but are distinct species. *C. delphinuloides* has a less elevated nucleus. It lacks the heavy, spiral ribs of *exacuum*. *Delphinuloides* has fine, almost microscopic, spiral lines which cover the whole surface of the shell. Over the greater portion of the body whorl fine, equal, axial lines cross the spiral threads. The sutural area is sunken but the sides are rounded and are not sharp as in *exacuum*. The umbilical margin is more rounded in *delphinuloides*.

The genus is represented in the Eocene of the Paris Basin by several species.

Conrad considered the species rare. The Harris collection contains numerous specimens.

Dimensions.—Height, 4 mm.; greatest diameter, 9 mm. (largest specimen).

Miss Bush[93] who examined the type of *Circulus* stated that the shell is not nacreous but the interior is smooth and shiny. She stated "the peritreme is not continuous in the young and even in the adult is modified on the body-whorl into a very thin glaze". Jeffreys had in a redefinition of his genus in 1883[94] described the peristome as discontinuous and the shell nacreous.

Dimensions.—Greatest diameter, 9 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707, 723 and 727. Gosport sand: locality 104 (type).

Genus **VITRINELLA** C. B. Adams, 1850[95]

Genotype by subsequent designation, Bush[96], 1897, *Vitrinella helicoidea* C. B. Adams. Living. Off Cape Hatteras, N. C.; Jamaica.

[92]Meyer, O., Bericht. Senck. natur. Gesell., p. 4, p. 1, figs. 3, 3a, 1886 as *Solarium* non *Solarium delphinuloides* Heilprin, 1880.
[93]Bush, K. J., 1897, pp. 110, 111.
[94]Jeffreys, J. G., Proc. Zool. Soc. Lond., p. 94, 1883.
[95]Adams, C. B., 1850, p. 9.
[96]Bush, K. J., 1897, pp. 106, 122.

Vitrinella cf. lævis (Meyer) Plate 2, figs. 10-12

Adeorbis laevis Meyer, 1886, Ala. Geol. Sur., Bull. 1, pt. II, p. 67, pl. II, figs. 29, 29a.

Teinostoma læve Dall, 1892, p. 414, section *Solariorbis*.

? Teinostoma lævis (Meyer) VanWinkle, 1919, Bull. Amer. Pal., vol. 8 No. 33, p. 12; Van Winkle, 1921, ibid, vol. 8, No. 36, p. 8.

Discoid; umbilicus large; margin rounded; aperture circular; whorls five; convex, smooth; suture distinct.

Locality.—Red Bluff, Miss.

In Vicksbury there occurs a variety "var Vicksburgensis," with smaller umbilicus.—[Meyer, 1886].

Several specimens which were found in the Claibornian, at Newcastle, Virginia were included under *Teinostoma lævis* (Meyer) from the Oligocene of Red Bluff, Miss. The author doubts that the Eocene and Oligocene forms are the same but until comparisons are made hesitates to add a new name.

The Eocene species resembles the figure of *V. lævis*. The specimens are entirely smooth. They are typical of the type species of *Vitrinella* as figured by Miss Bush[97].

This species is certainly not a *Teinostoma* as now used. The umbilicus is widely open and the whorls of the spire are not enveloped nor is there any tendency to become so.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md. (*Adeorbis laevis* Meyer).

Occurrence.—Lower Claiborne: locality 843. Oligocene: Red Bluff, Miss. (type).

"Vitrinella" virginiensis (Van Winkle) Plate 2, fig. 9

Adeorbis ? virginiensis Van Winkle, 1919, Bull. Amer. Pal., vol. 8, No. 33, p. 9, pl. 1, fig. 13.

The type of this species is broken but the remaining portion of the shell reveals a form which had unique characters. It seems to have been a coiled shell with similar coiling to that of *Vitrinella*. The outer layer of the matrix has peeled off but reexamination of the fragment verifies the original description of the surface sculpture. Shortly more of the superficial layer will erode and the striated character of the surface will be lost for future examination.

Miss Bush[98] referred with a question, a species which has a striated surface to *Vitrinella*. In that species the striations cover the whole surface of the shell. In the Eocene form the upper half

[97]Bush, K. J., 1897, p. 122, pl. XXIII, figs. 9, 9a.

[98]Bush, K. J., 1897, p. 124, pl. XXII, fig. 7, pl. XXIII, figs. 4, 14; Verrill, A. E., l. c., vol. VI, p. 242, 1884, *Ethalia multistriata*.

of each whorl is smooth.

Dimensions.—Greatest diameter, 4 mm., holotype.

Holotype.—No. 1400, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 843.

Family ? TURBINIDÆ

Genus TIBURNUS de Gregorio, 1890[99]

Genotype by original designation *Turbo naticoides* Lea (= *Natica eborea* Conrad). Claibornian Eocene. Southern United States.

Tiburnus eborea (Conrad) Plate 5, figs. 21, 22, 25, 26, 29

Natica eborea Conrad, 1833, Nov., p. 46; Conrad, 1834, App. in Morton, p. 4; H. C. Lea, 1848, p. 102; d'Orbigny, 1850, p. 346; Harris, 1895, p. 17.

Turbo naticoides Lea, 1833, Dec., p. 125, pl. 4, fig. 114; H. C. Lea, 1848, p. 106.

Turbo (*Tiburnus*) *naticoides* (Lea) de Gregorio, 1890, p. 143, pl. 13, figs. 21-26; Cossmann, 1893, p. 21.

Tiburnus naticoides (Lea) Cossmann, 1918, Essais Pal. Comp., 11 liv., pp. 248-249, pl. VIII, figs. 34, 35.

Dillwynella naticoides (Lea) Dall, 1892, p. 418.

Smooth and polished; spire slightly prominent, with convex whorls; body whorl subcompressed; umbilicus minute, with a groove beneath it; aperture small, circular.—[Conrad, 1833].

Nucleus consists of an enlarged, bulbous whorl flattened along the margin but projecting over the line of the spire; surface polished but none of the specimens examined shows any trace of nacre.

Since Dall's description of the species in the Wagner paper, this form has gone by the name of *Dillwynella naticoides* (Lea). The nucleus of the Claiborne shell is strikingly like the Recent type of *Dillwynella*[100], *D. modesta* Dall. The general character of the shell and the peculiar flattening of the margin of the columella seem alike in both of the species. *D. modesta* is known to have a spiral, horny operculum. *T. eborea* agrees as Dr. Dall pointed out with *Dillwynella,* in having an nonnacreous shell. It may be that the fossil will prove to be of the same type as the living.

[99]de Gregorio, A., 1890, p. 143.
(*Platychilus* Cossmann, 1888 non Yakoblev, 1874; *Simochilus* Harris and Burrows, 1891.)

[100]Dall, W. H., Mus. Comp. Zool., Bull. No. 18, p. 362, pl. XXI, figs. 3, 3a, 1889 monotype; Dall, W. H., U. S. Nat. Mus., Bull. No. 37, pl. 21, fig. 3, 1889.

Conrad, according to Dall[101] confused the name of this species with the *Trochus eborea* Wagner, a Miocene species and so labelled Eocene specimens in the Smithsonian Institution Collection. Dall contended that the identity of *Natica eborea* Conrad was not known clearly enough by Conrad to have priority of naming. This is not wholly true for Conrad in the list of Eocene species published in Morton's "Synopsis", 1834, p. 4, gives *Turbo naticoides* Lea as synonymous with *N. eborea* Conrad. Conrad therefore knew the identity of the species.

T. labiosus (Cossmann)[102] of the Parisian Lutetian is a species of close relationship but with slight variations. Cossmann made the species the monotype of a new genus *Platychilus*. The name was shown by Harris and Burrows[103] in 1891 to be preoccupied. They renamed the Cossmann form but the year previous, De Gregorio had given the name *Tiburnus* with the American Eocene species as type. The Parisian shell differs by having a slightly nacreous interior. Cossmann in 1918, described the genus as nacreous which is misleading as regards the type material.

Dimensions.—Height, 6 mm.; greatest diameter, 7 mm., lectotype *Turbo naticoides* Lea.

Lectotype.—Lost. Lectotype *Turbo naticoides* Lea, No. 5637, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Tiburnus texanus (Harris) Plate 5, figs. 3, 5-7

Dillwynella ? texana Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 84, pl. 9, fig. 13.

Size and general form as indicated by the figure; whorls 4; spiral, smooth, and shining; body whorl nearly smooth but showing a slight tendency to bear furrows or lines radiating from the suture; umbilicus small; mouth round.

The umbilical portion of this shell appears to be more or less whitened or enameled.

Locality.—Jones' farm, Hurricane Bayou, Houston Co.; from Lee County and Mosley's Ferry, Brazos River, (Aldrich's collection).

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum. Unfortunately broken since figuring.—[Harris, 1895].

101 Dall, W. H., 1892, p. 398.

102 Cossmann, M., Ann. Soc. Roy. Mal. Belgique, Tome XXIII, p. 59, pl. III, figs. 16-17, 1888 *Platychilus*.

103 Harris, G. F. and Burrows, H. W., Eoc. Olig. Beds Baris Basin, Geol. Asso., p. 112, 1891.

Dimensions.—Height, 1.25 mm.; greatest diameter, 2.25 mm.
Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas. Probably lost.
Occurrence.—Lower Claiborne: locality 725.

Genus **CIRSOCHILUS** Cossmann, 1888[104]

Genotype by original designation *Delphinula striata* Lamarck. Eocene. Paris Basin.

Subgenus **CLAIBORNIA**, new subgenus

Genotype *Turbo lineata* Lea. Gosport sand, Eocene. Alabama.

Shell small, elevated in the young, less elevated in the adult.; nucleus minute; shell faintly nacreous on the interior; aperture circular; peristome discontinuous; umbilical opening nearly closed in young, increasing in size with age; umbilicus large in the adult exhibiting all the whorls, spirally striate within; margin of the umbilicus slightly angulated, smooth in adult, wrinkled in the young; columellar area flattened with a callus; shell spirally striate.

Cirsochilus (Claibornia) lineatus (Lea) Plate 5, figs. 19, 23, 30; Plate 78, figs. 12, 17, 18

Turbo lineata Lea, 1833, p. 126, pl. 4, fig. 116; H. C. Lea, 1848, p. 106 [*lineatus*]; non *Turbo lineatus* Hall, 1843.
Solariorbis lineata (Lea) Conrad, 1865, p. 30; Conrad, 1866, p. 14; Harris, 1895, p. 24.
Delphinula lineata (Lea) de Gregorio, 1890, p. 141, pl. 13, fig. 10-11.
Solariella lineata (Lea) Dall, 1892, pp. 407, 412.
Collonia lineata (Lea) Cossmann, 1893, p. 22, pl. II, figs. 25, 26, *Cirsochilus*.

Shell rather depressed above, rounded below, nearly covered with transverse elevated lines, smooth round the umbilicus; substance of the shell thin; suture furrowed; umbilicus rather large, round; whorls four; mouth round; outer lip edged.
Length .1. Breadth 3-20ths, of an inch.
The smaller figure is of the size of nature.
Observations.—This minute species differs from the preceding, in having transverse lines and a wide furrow along the suture. The whorls are also more rounded.—[Lea, 1833].

Nucleus minute; spire elevated; in the young and immature specimens the spire is much more elevated than in the adult; umbilicus in the young small but increases with age until in the adult, the opening is wide and opened to the apex of the shell as in *Circulus;* basal margin of the umbilicus in immature specimens

[104] Cossmann, M., Ann. Soc. Royale Mal. Belgique, tome XXIII, p. 72, 1888 as a section.

slightly angulated and wrinkled by the longitudinal growth; sides within the opening show fine, spiral lines, which increase in size in the adult; peristome not continuous; columellar margin turns back and is flattened by a thin callus; interior of the shell faintly nacreous; surface of the whorls covered with well developed, spiral ribs with wide interspaces; they cover most of the entire surface of young specimens but on the adult the basal surface around the umbilicus is smoother; lines on the spire of the immature shells may be finer; specimens examined were slightly worn in that region.

This form is an exceedingly interesting species because it shows in its life history transition of two types of coiling. The immature specimens are elevated while the adult is slightly depressed. A suite of four specimens in the Harris collection represents four stages in the growth of the shell. They show the umbilical opening in the young nearly closed to a wide opening in the adult.

The species is not a *Solariella* as classified by Dall. It does not have the strong, nacreous shell nor the crenulated umbilical border of that genus. The character which definitely excludes the species is the change in the form of the shell from youth to old age.

The group to which the species seems to bear the closest relationship is *Cirsochilus* of Cossmann, the type of which occurs in the Paris Basin Eocene. Cossmann extends the range of the genus back to the Bajocian.

The immature specimens of *lineatus* are like the adult of *Cirsochilus* in shape and character of the umbilicus. *Claibornia* seems to have developed further in the looseness of the coiling accompanied by a flattening of the spire. Cossmann speaks of a varicose pad on the exterior of the labrum but which does not exist in the adult. There is no character on *Claibornia* which is recognized as such. However, the collections studied do not include specimens of *C. lineata* in the first stages of growth.

Dimensions.—Height, 2.5 mm.; greatest diameter, 3.5 mm., lectotype. Height, 3 mm., greatest diameter, 3.75 mm., (immature). Height, 3 mm., greatest diameter, 5 mm., (adult).

Lectotype.—No. 5655, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

? Cirsochilus claibornensis (Dall) Plate 5, fig. 14

Collonia claibornensis Dall, 1892, p. 388, pl. 22, fig. 26.
Cirsochilus claibornensis (Dall) Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 136.

Eocene of the Claiborne sands horizon, at Claiborne, Ala., Burns; a single example.

Shell small, turbiniform, spirally sculptured, of four whorls; upper whorls with small, alternated spirals, of which one larger than the rest partly tabulates the whorls in front of the suture; periphery rounded, also the base, both evenly spirally threaded, the interspaces obliquely cut by regularly spaced incremental lines; umbilicus closed, umbilical rib wide, strong, not very elevated; marginal sulcus at the pillar distinct, aperture rounded, margin thickened and slightly expanded. Alt. 3.5; max. diam. 3.25 mm.

The specimen had been broken before reaching maturity, which has somewhat affected the growth of the umbilical rib. The umbilicus itself is closed, but the form and character of the shell on the whole are so strikingly similar to the younger stages of *Collonia elegantula* that I have little doubt as to its generic place.—[Dall, 1892].

Specimens of this species described by Dall from a single specimen have not been found. Dall did not mention whether the shell was nacreous. Since *Collonia* according to Cossmann is not nacreous or is feebly so, the generic determination would indicate that the shell was not. *Cirsochilus* is nacreous. The umbilical area and columellar margin of *claibornensis* seem like *Cirsochilus*. The umbilical rib described by Dall is not crenulated as in *Collonia*. The umbilicus in *Collonia* is profound. It is open in *Cirsochilus* but not as large as in *Collonia*. That of *C. claibornensis* is closed.

Holotype.—No. 113002, United States National Museum.

Occurrence.—Gosport sand: Claiborne, Ala.

"Turbo zecus" de Gregorio Plate 5. fig. 2

Turbo zecus de Gregorio, 1890, p. 142, pl. 13, fig. 20.

Testa minuta ovata, crassa, subturrita; anfractibus convexiusculis 4, laevigatis, antice paulo subangulatis; ultimo in parte antica axialiter plicata; apertura postice callosa. L. 2 mm.

C'est une espèce très douteuse, car je n'en ai qu'un seul exemplaire pas en bon état de conservation. Elle ressemble au *T. parvus* H. Lea; mais celui-ci dit que cette espèce est voisine du *T. naticoides* J. Lea qui est une espèce très différente. Coll. mon Cabinet.—[De Gregorio, 1890].

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Gosport sand: Claiborne, Ala. (De Gregorio).

"Turbo sp." de Gregorio Plate 5, fig. 1

Turbo sp. de Gregorio, 1890, p. 144, pl. 13, fig. 27.

Testa potius magna, ovata, turbiformis; anfractibus convexis, rotundatis, spiraliter funiculatis.

Je ne possède de cette espèce qu'un seul moule. La roche est la même de mon exemplaire de *Xenophora agglutinans* Lamk. C'est intéressant par sa grand taille.—(Coll. mon Cabinet).—[De Gregorio, 1890].

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Gosport sand: Claiborne, Ala. (De Gregorio).

Family MELANELLIDÆ

Genus MELANELLA Bowdich, 1822[104]

(*EULIMA* Risso, 1826).

Genotype by monotypy *M. dufresnii* Bowdich. Living. Indo-Pacific.

Melanella notata (Lea) Plate 6, figs. 20, 26-30; Plate 79, figs. 1, 2

Pasithea notata Lea, 1833, p. 101,, pl. 4, fig. 80; H. C. Lea, 1848, p. 103; Harris, 1895, p. 30.
cf. *Pasithea lugubris* Lea, 1833, p. 101, pl. 4, fig. 81; H. C. Lea, 1848, p. 103; Harris, 1895, p. 26.
Pyramis notata Conrad, 1834, App. in Morton, p. 4.
Eulima notata Conrad, 1865, p. 29; Conrad, 1866, p. 14; de Gregorio, 1890, p. 162, pl. 16, fig. 6.
cf. *Eulima lugubris* (Lea) Conrad, 1865, p. 29; Conrad, 1866, p. 14; Meyer, 1887, Acad. Nat. Sci. Phila., Proc. vol. 39, p. 54, pl. III, fig. 8; de Gregorio, 1890, p. 161, pl. 16, figs. 5a, b. non 7; Cossmann, 1893, p. 24, pl. II, fig. 3; Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 193.
? *Turbonilla lugubris* (Conrad) Dall, 1892, p. 255.
non *Rissoina notata* Cossmann, 1893, p. 27, pl. 1, fig. 34 [=*Eulima cossmanni* Aldrich, 1910].
non *Rissoina* (*Leaella*) *notata* Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 91, pl. III, figs. 59-60 [=*Eulima cossmanni* Aldrich, 1910].

Shell subulate, highly polished; substance of the shell rather thick; apex acute; suture very small; whorls eleven, very flat, each one being marked with an impressed oblique line of growth; mouth small, acutely angular above, about one-fifth the length of the shell; columella somewhat thickened at the base; outer lip somewhat arched, with an obtuse edge.

Length 7-20ths, Breadth .1, of an inch.

Observations.—This pretty little species is more attenuate than the preceding, and is remarkable for the slightly oblique lines of growth in each whorl, and which recede spirally from the mouth to the apex.—[Lea, 1833].

Melanella notata and *M. lugubris* are similar as may be seen by a comparison of the Meyer drawings of the type specimens included herein. The lectotype of *M. lugubris* is half the size of that of *M. notata*. They both have the characteristic angulation of the body whorl. *M. lugubris* may be a young specimen of *notata*.

The *Rissoina notata* described and figured by Cossmann as the species of Lea is not the same as *Melanella notata* Lea. Aldrich[105] made the distinction in 1910 and renamed Cossmann's form *Eulima cossmanni*. (See pl. 6, fig. 4).

[104]Bowdich, T. E., 1822, pt. 1, p. 27.
[105]Aldrich, T. H., Nautilus, vol. 24, p. 75, 1910.

Cossmann placed the specimen which he identified as Lea's form in the genus *Rissoina* and later because of the characters which his specimen exhibited made a new subgenus giving *Pasithea notata* Lea as type. Cossmann pointed out the posterior sinuosity of the labrum and irregular varices. *Melanella notata* (Lea) as well as *M. exilis* (Gabb) have the outer lip curved forward from the posterior line. This has been illustrated by fig. 6, pl. 17. Hence such a character does not exclude the species from the Melanellas. Varices do not occur on *M. notata* Lea. The species does not exhibit characters warranting a separation from *Melanella.*

Cossmann's figures in Essais Pal. Comparée, 12 liv., pl. III, figs. 59-60 appear like typical *M. notata* (Lea) but because of Cossmann's diagnosis there does not seem to be any other way than to allow to stand on Cossmann's authority, a species which he called *M. notata* Lea but which is not the same as Lea's species. Cossmann's specimens will take the specific name *cossmanni* Aldrich as is stated in the beginning of this discussion. This is the form which Cossmann was using when he diagnosed his new subgenus *Leaella* and were it not for definite type designation rules, would be so used. However Cossmann [106] definitely gives "*Leaella,* genotype *Pasithea notata* Lea". Regardless of how Cossmann described the species, the characters of *Leaella* are restricted to *Pasithea notata* Lea (non Cossmann). In such procedure *Leaella* becomes synonymous with *Melanella.*

If the diagnosis of Cossmann for *Rissoina notata* Cossmann= *Eulima cossmanni* (Aldrich) non *Pasithea notata* Lea is ever substantiated than further naming might be necessary.

Dimensions.—Height, 8.5 mm.; greatest diameter, 4 mm., lectotype *P. notata* Lea; height, 4.5 mm.; greatest diameter, 1.5 mm., lectotype *P. lugubris* Lea.

Lectotypes.—No. 5495 (*P. notata* Lea), No. 5497 (*P. lugubris* Lea) Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Melanella claibornia, new species Plate 6, figs. 10, 11

Shell medium in size; sides of the shell straight to the midline

[106]Cossmann, M., 1921, ibid, p. 91.

of the body whorl; body whorl angulated at the central line from which it slopes convexly to the base; suture distinct; apical whorls destroyed; aperture obovate; columellar callus thin and moderately wide; line of inner lip straight to anterior end.

This species resembles *M. notata* (Lea) in the angulated shape of the body whorl. *M. notata* tends to have the line of the inner lip straight as in *M. claibornia,* n. sp. *M. claibornia* may be distinguished from *M. notata* as well as from the other southern Claibornian species in having the basal line of the inner lip straight and produced anteriorly. This distinction may be seen by comparing the rear views of the shells. *M. claibornia* has the appearance of a greater concavity on the right side (rear view).

Syntypes.—Nos. 2690, 2691, Paleontological Research Institution.

Occurrence.—Gosport sand: locality 104.

Melanella aciculata (Lea) Plate 6, figs. 18, 19; Plate 78, fig. 8

Pasithea aciculata Lea, 1833, p. 102, pl. 4, fig. 82; H. C. Lea, 1848, p. 103; Harris, 1895, p. 2.

Eulima aciculata (Lea) Conrad, 1865, p. 28, Conrad, 1866, p. 14; de Gregorio, 1890, p. 161, pl. 16, fig. 1-3; Cossmann, 1893, p. 24, pl. II, fig. 2; non *Eulima aciculata* Pease, 1860.

? *Eulima aciculata* (Lea) Meyer, 1887, Acad. Nat. Sci. Phila., Proc. vol. 39, p. 54, pl. III, fig. 5 = *Eulima jacksonensis* de Gregorio, 1890, p. 161.

? *Pasithea minima* H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, p. 92, pl. 1, fig. 1; H. C. Lea, 1848, p. 103; Harris, 1895, p. 28, [*Eulima*].

Shell acicular, highly polished; substance of the shell thin; apex very acute; suture linear, very minute; whorls nine, flattened; mouth elongate, acutely angular above—obtusely angular below, about one-fourth the length of the shell; columella slightly thickened; outer lip edged.

Length 3-20ths, Breadth 1-20th, of an inch.

The smaller figure is of the size of nature.

Observations.—This is the most attenuate of the genus, so far as my observations have extended, and is an interesting minute species, remarkable for its high polish and delicate form.—[Lea, 1833].

The species differs from *M. notata* (Lea) in having the middle outline of the body whorl regularly rounded. In *M. notata* the line of the body whorl is straight posteriorly, sloping abruptly from the midline to the base.

Dimensions.—Height, 4+ mm.; greatest diameter, 1 mm., lectotype.

Lectotype.—No. 5499, Academy of Natural Sciences, Philadelphia, Pa. *M. aciculata* (Lea) No. 13169, A. N. S.; *Pasithea minima* H. C. Lea, lost.

Occurrence.—Gosport sand: locality 104.

Melanella exilis (Gabb) Plate 6, figs. 6, 12, 16, 17; Plate 78, fig. 21

Eulima exilis Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. IV, p. 385, pl. 67, fig. 43; Conrad, 1865, p. 29; Conrad, 1866, p. 14; Heilprin, 1891, p. 400; Meyer, 1885, Amer. Jour. Sci., 3d. ser., vol. 29, p. 464; non *Eulima exilis* Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 96, pl. 12, fig. 12 = *M. wheeleri*, new species.

Elongate, slender, polished; whorls eight; apex acuminate, mouth small, outer lip nearly straight.

Dimensions.—Length .23 in., width of body whorl, .05 in., length of mouth .05 in.

Locality.—Caldwell Co. My collection with the next two species. Rare. —[Gabb, 1860].

The posterior portion of the outer lip is slightly sinuated, swinging forward from the suture to about the midline.

This species resembles *M. aciculata* in shape. It differs in having the body whorl slightly less enlarged and the line of the left side of the body whorl more regularly convex.

The specimen from Woods Bluff, Ala., Sabine Eocene, included under *Eulima exilis* Gabb by Harris[107] differs from *exilis* as found in the lower Claiborne of Texas in having the body whorl excavated more in the basal region, and the inner lip being more elongated and pronounced. The Sabine specimen is herein separated under the name *Melanella wheeleri*, n. sp. *M. wheeleri* attains as large size as the holotype, without the apical whorls and measures 9 mm. in height and 3.5 mm., greatest diameter. The species is named for H. E. Wheeler of Birmingham, Ala.

The holotype of *M. wheeleri* is No. 1383, Paleontological Research Institution.

Dimensions.—Height, 4 mm.; greatest diameter, 2 mm., broken holotype.

Holotype.—No. 13276, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707, 708, 723, 733 and 743; Caldwell, Texas (Gabb).

Melanella tenua (Gabb) Plate 78, fig. 20

Eulima tenua Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser., Jour. vol. IV, p. 386, pl. 67, fig. 45; Conrad, 1865, p. 29; Conrad, 1866, p. 14; Heilprin, 1891, p. 400.

Eulimella tenua (Gabb) Harris, 1899, Bull. Amer. Pal., vol. 3, No. 11, p. 97 [partim] non pl. 12, fig. 16.

[107]Harris, G. D., 1899, p. 96, pl. 12, fig. 12.

Very elongated and narrow; whorls nine, rounded; suture distinct; mouth very small, oval.

Dimensions.—Length .15 in., width of body whorl 0.25 in., length of mouth .02 in.—[Gabb, 1860].

The holotype of the species has the apical whorls missing. The shell gradually tapers so that the whorls have a somewhat quadrate appearance. In shape the species resembles *Pyramidella perexilis* (Conrad). There is a slight umbilical cavity on the holotype which might appear like a fold. The Meyer drawing of the holotype is included.

Prof. Harris figured a specimen from Woods Bluff, Ala., Sabine Eocene in his monograph on that fauna which he included under *Eulima tenua* Gabb. The Woods Bluff specimens reveal a trace of a collumellar fold. Such a character places the species in the Pyramidellidæ.

Comparing the Sabine specimen with the holotype of *E. tenua,* a difference in relationships is suggested.

The Sabine specimen tapers less rapidly and the base of the body whorl and aperture do not have as an elongate appearance as *Eulima tenua.* The nucleus of the Sabine shell is well preserved. It is that of *Turbonilla* of the Pyramidellidæ.

The author is therefore retaining *Eulima tenua* Gabb in the Melanellidæ and separating the Sabine shells. The Sabine specimen is named *Turbonilla sabina,* n. sp. For further discussion see under that species.

Dimensions.—Height, 3 mm. (fragment); greatest diameter, 1 mm., holotype.

Holotype.—No. 13277, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: "Caldwell Co., Texas" (Gabb).

Melanella extremis (Aldrich) **Plate 6, figs. 8, 9, 13, 14, 15, 21**

Eulima extremis Aldrich, 1911, Bull. Amer. Pal., vol. 5, No. 22, p. 8, pl. III, fig. 4.

This species is the slenderest yet described from the southern Eocene.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md. The specimen is broken.

Occurrence.—Lower Claiborne: localities 136, 708, 723, 727 and 741. Gosport sand: locality 104; Tombigbee River about one mile above St. Stephens and at Claiborne Bluff, Ala. (Aldrich).

Melanella tenaxa, new name Plate 6, fig. 5

Eulima texana Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d., ser., vol. IV, p. 386, pl. 67, fig. 44; Conrad, 1865, p. 29; Conrad, 1866, p. 14; Heilprin, 1891, p. 400; non *Eulima ? texana* Roemer, 1849, Texas, p. 413.

Elongated, more robust than the preceding; [*exilis*] whorls eight, slightly rounded, narrow; surface polished; suture distinct.

Dimensions.—Length .12 in., width of body whorl .03 in., length of mouth .02 in.—[Gabb, 1860].

The holotype of this species is lost. The original figure is poor.

Occurrence.—Lower Claiborne: "Caldwell County, Texas" (Gabb).

Genus **NISO** Risso, 1826[108]

Genotype by monotypy *Niso eburnea* Risso. Living. Mediterranean.

Niso umbilicata (Lea) Plate 6, figs. 22-25

Pasithea umbilicata Lea, 1833, p. 103, pl. 4, fig. 85; H. C. Lea, 1848, p. 103; Harris, 1895, p. 47.

Pyramis terebellata Conrad, 1834, App. in Morton, p. 4 non *Pyramidella terebellata* (Lamarck).

Niso umbilicata (Lea) d'Orbigny, 1850, p. 343; Conrad, 1865, p. 29; Conrad, 1866, p. 14; Heilprin, 1879, Acad. Nat. Sci. Phila., Proc. vol. 31, p. 224 [non *Niso terebellatus* Lam.]; de Gregorio, 1890, p. 162, pl. 16, figs. 7 a, b, 8; Dall, 1892, p. 247; Cossmann, 1893, p. 24; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 97, pl. 12, fig. 13; Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 206.

Non *Bonellia lineata* Conrad, 1865, p. 29. [corrected on p. 191 of same publication].

Shell elevated above, rounded below, subcarinate, polished; substance of the shell thin; apex acute; suture linear; umbilicus large; whorls nine, flattened; mouth subovate, acutely angular above, one-fifth the length of the shell; columella incurved at base; margin entire.

Length .2, Breadth .1, of an inch.

The smaller figure is of the size of nature.

Observations.—This smooth and polished species differs from the above in being umbilicate. Its umbilicus is wide, with a large spiral groove. On some of the whorls the line of growth may be indistinctly seen.—[Lea, 1833].

The nucleus consists of four, smooth whorls, minute and conical. The spiral groove of the umbilicus which Lea speaks of in the description seems to be just back of the margin of the umbilicus. The edge of the umbilicus is constricted slightly in maturity and pronounced in youth. Back from the mouth of the umbilicus where the area becomes constricted, the sides may be plaited longitudinally.

As has been pointed out by authors the Parisian analogue of *N. umbilicata* (Lea) is *N. terebellata* (Lamarck).

N. umbilicata originated in the Sabine (Wilcox) Eocene.

The lectotype has been broken since Lea's description. Conrad possessed three specimens of the species.

[108]Risso, A., 1826, vol. 4, pp. 218-219, pl. 7, fig. 98.

Dimensions.—Height, 19 mm. greatest diameter, 7 mm.

Lectotype.—No. 5506, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Sabine (Wilcox) Eocene: Woods Bluff and Yellow Bluff, Ala. Lower Claiborne: localities 24, 726 and 741. Gosport sand: locality 104 (type).

Niso sp.

Niso sp. Vaughan, 1896, U. S. Geol. Sur., Bull. 142, p. 36, pl. III, figs. 7, 7a.

The specimens figured are much larger than *N. umbilicata*, Lea, and probably should be considered another species, but as I have no perfect specimens, no name is proposed for it.

Locality.—St. Maurice (Vaughan).

Geological horizon.—Lower Claiborne.

Specimens figured in United States National Museum.—[Vaughan, 1896].

Typical *Niso umbilicata* (Lea) is commonly as large or larger than Vaughan's specimens. Vaughan's specimen measured 17 mm. in height. Such a size is therefore not a factor in separating the forms. A specimen in the Harris collection from St. Maurice, La., is *Niso umbilicata.* The specimen resembles the shell of Vaughan from St. Maurice. Probably *Niso* sp. Vaughan is *N. umbilicata* Lea.

Holotype.—No. 147043, United States National Museum, Washington, D. C.

Genus **PASITHEA** Lea, 1833

The genus *Pasithea* Lea, 1833, non Lamarck, 1812, was a most unfortunate grouping of heterogenous shells. Lea's original discussion included nine species without a designation of any one to stand for the type. The nine species belong mostly to different genera and in some cases to different families. The nomenclature of the group has become so complicated and the disagreement among later authors as to the proper family relationships of the species so varied that a list of the species and their present classification is included.

1. *P. secale* Lea = *Bayania secale* (Lea); Pseudomelaniidæ
2. *P. notata* Lea = *Melanella notata* (Lea); Melanellidæ
3. *P. lugubris* Lea = *Melanella lugubris* (Lea); Melanellidæ
4. *P. aciculata* Lea = *Melanella aciculata* (Lea); Melanellidæ
5. *P. striata* Lea = questionable
6. *P. sulcata* Lea = *Actæonema sulcata* (Lea); Rissoinidæ
7. *P. umbilicata* Lea = *Niso umbilicata* (Lea); Melanellidæ
8. *P. guttula* Lea = *Pasitheola guttula* (Lea); Melanellidæ [placed in Melaniidæ by Cossmann].

9. *P. clairbornensis* Lea = *Pasitheola claibornensis* (Lea); Melanellidæ [placed in Melaniidæ by Cossmann].

"Pasithea" striata Lea Plate 82, fig. 6

Pasithea striata Lea, 1833, p. 102, pl. 4, fig. 83; H. C. Lea, 1848, p. 103.
Pyramis striata (Lea) Conrad, 1834, App. in Morton, p. 4 [partim]; de Gregorio, 1890, p. 161, pl. 15, fig. 40 [partim].
Menestho striata (Lea) Conrad, 1860, Acad. Nat. Sci. Phila., 2d. ser., vol. IV, p. 295.
Cœlatura striata (Lea) Conrad, 1865, pp. 28, 35.
Actæonema ? striatum (Lea) Cossmann, 1893, p. 29 [partim] non Conrad, 1865.

Shell conical, transversely striate; substance of the shell thin; apex rather acute; suture impressed; whorls eight, rounded; mouth subovate, about one-fourth the length of the shell; columella flattened at the base.
Length 4-20ths, Breadth nearly .1, of an inch.
The smaller figure is of the size of nature.
Observations.—This species differs from those which precede it, in having transverse striæ. The whorls are inflated, while the others are flat.—[Lea, 1833].

Lea used the term inflated in regard to the whorls. They are more inflated when compared to the species of *Melanella* which preceded *striata* but the whorls would not be spoken of as inflated when taken by themselves.

Lea's figure does not represent the species well. A Meyer drawing of the holotype is included. The sides of the whorls are straight, slightly curved at the impressed sutures suggestive of *Turritella*. The nucleus consists of two, smooth whorls. On the basis of the character of the nucleus the species is separated from *Tuba* where the *Actæonema striata* Conrad is placed. The generic status of *Pasithea striata* Lea is a question. It may be the apical whorls of a *Turritella*.

Dimensions.—Height, 6 mm.; greatest diameter, 2 mm., lectotype.

Lectotype.—No. 5502, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Genus **PASITHEOLA** Cossmann, 1896[109]

(*Pasithea* Lea, 1833 [partim]; non Lamarck, 1812).

Genotype by original designation, Cossmann, 1893[110], *Pasithea guttula* Lea. Claibornian Eocene. Alabama.

[109]Cossmann, M., Ann. Soc. Roy. Mal. Belg., tome 31, p. 27, 1896.
[110]Cossmann, M., 1893, p. 28 designated *Pasithea guttula* Lea type of *Pasithea* Lea, 1833. In 1896, ibid, Cossmann substituted *Pasitheola* for *Pasithea* Lea which was preoccupied by Lamarck, 1812.

Pasitheola guttula (Lea) Plate 6, figs. 2, 3

Pasithea guttula Lea, 1833, p. 104, pl. 4, fig. 86; H. C. Lea, 1848, p. 103; Meyer, 1887, Acad. Nat. Sci. Phila., Proc. vol. 39, p. 54, pl. III, fig. 6; Harris, 1895, p. 21.
Eulima (*Pasithea*) *guttula* (Lea) Conrad, 1865, p. 29; Conrad, 1866, p. 14.
Pasithea guttula (Lea) de Gregorio, 1890, p. 162, pl. 16, figs. 9, 10; Cossmann, 1893, p. 28, pl. II, fig. 21.
Pasitheola guttula (Lea) Cossmann, 1896, Ann. Soc. Roy. Mal. Belg., tome 31, p. 27; Cossmann, 1897, Revue Paleozool., Ann. 1, p. 59; Cossmann, 1909, Essais Pal. Comp., 8 liv., p. 137 [section of *Balanocochlis* Fischer].

Shell subovate, truncate at top, smooth; substance of the shell rather thin; apex truncate; suture linear; whorls four, flattened above; mouth subovate, acutely angular above, about two-fifths the length of the shell; columella slightly incurved at base; margin thickened on the superior part, closing up a small portion of the mouth.

Length nearly .1, Breadth 1-20th, of an inch.

The smaller figure is of the size of nature.

Observations.—A single perfect specimen only of this curious little species has been observed by me. It is closely allied to the *Claibornensis*, but differs in the mouth, in the flatness of the whorls and the truncation of the apex.—[Lea, 1833].

The truncation of the spire of this species, with the great length of the body whorl compared with the whorls of the spire mark the species as distinct in shape. The length of the whorls of the spire increases with age. The nucleus consists of two or two and one-half smooth whorls, flattened above.

Conrad put this and allied small species from Claiborne in the family Melanellidæ (Eulimidæ). Cossmann[111] believed this species, to which he restricted the original *Pasithea* of Lea, was related to *Balanocochlis* Fischer[112] of the family Melaniidæ.

Several species of *Pasitheola*[113] occur in the Paris Basin Eocene.

Dimensions.—Height, 2 mm.; greatest diameter, 1 mm., holotype (apex broken).

Lectotype.—No. 5507, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Pasitheola claibornensis (Lea) Plate 78, fig. 19

Pasithea Claibornensis Lea, 1833, p. 104, pl. 4, fig. 87; H. C. Lea, 1848, p. 103; de Gregorio, 1890, p. 163, pl. 16, fig. 14; Harris, 1895, p. 11.
Eulima (*Pasithea*) *claibornensis* (Lea) Conrad, 1865, p. 29; Conrad, 1866, p. 14.

[111]Cossmann, M., Essais Pal. Comp., 8 liv., p. 136, 1909.

[112]Fischer, Paul, 1887, p. 701, type *Melania glans* von Busch. Living. Indo-Pacific.

[113]Cossmann, M., and Pissarro, G., Icon. complète, pl. XVIII, figs. 115-1, 2, 3, 1910-13.

Bayania claibo.nensis (Lea) Cossmann, 1893, p. 28 non *B. claibornensis* (Heilprin).

Shell subovate, smooth; substance of the shell very thick; apex obtuse; suture impressed; whorls four, rounded; mouth small, subangular above; one-third the length of the shell; columella thickened; margin very much thickened on the superior part, closing up a large portion of the mouth.

Length .2, Breadth .1, of an inch.

Observations.—A single specimen, the mouth of which is not perfect, is the only one which I have seen. It has a short spire, but is most remarkable for its small and almost round mouth, above which the margin is so much thickened as to fill up a large portion of the arch. It is more nearly allied to the *guttula*, than any other of the genus.—[Lea, 1833].

The figure of the type of *P. claibornensis* suggests that the specimen may be a pathologic shell of *P. guttula.* The outer lip appears abnormally thickened much as the excess of material in some specimens of *Bullia subglobosum* (Conrad). A discussion of such a condition is given under *Expleritoma prima.* Specimens of *P. claibornensis* have not been found to verify this suggestion.

Dimensions.—Height, 5 mm.; greatest diameter, 3 mm., holotype.

Holotype.—No. 5508, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala. (Lea).

Pasitheola tornatelloides (Meyer) Plate 6, fig. 1

Amaura tornatelloides Meyer, 1886, Ala. Geol. Sur., Bull. No. 1, pt. II, p. 69, pl. 1, fig. 12.

Pasithea tornatelloides (Meyer) de Gregorio, 1890, p. 165, pl. 16, fig. 35; Cossmann, 1893, p. 28.

cf. *Pasithea galma* de Gregorio, 1890, p. 163, pl. 16, figs. 16, 17.

Shell oval; imperforate, smooth; spire conical; apex obtuse; suture very distinct; whorls five; columella thickened; aperture semicircular, acute posteriorly, and with an indistinct broad emargination anteriorly.

Locality.—Claiborne, Ala.

I found only the figured specimen.—[Meyer, 1886].

There is a suggested resemblance between the figure of this species, the figure of *Pasithea galma* de Gregorio and the young of *"Bayania" secale* (Lea). But on careful comparison of the young of *B. secale* with the corresponding size of each of the two names listed, *B. secale* is found to have a longer spire with one or two more whorls. It, however, seems proper that *P. galma* de Gregorio is the young of *P. tornatelloides* (Meyer) as was suggested by Meyer or it is the young of *P. guttula* (Lea).

Dimensions.—Height, 3.5 mm.; greatest diameter, 2.5 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala. (Meyer).

Rissoina (*Leaella*) *notata* Cossmann=*Melanella* or *Rissoina cossmanni* Aldrich (pl. 6, fig. 4) whichever genus the species is determined to be by an examination of the type specimens. See discussion under *Melanella notata* (Lea) and *Rissoina* (*Leaella*) *cossmanni* (Aldrich).

Family PYRAMIDELLIDÆ

Genus PYRAMIDELLA Lamarck, 1799[114]

Genotype by monotypy *Trochus dolabratus* Linnæus. Living. Southern Florida and West Indies.

In the study of the Clairbornian Pyramidellidæ the number of visible columellar plications varies with the individual specimens of a species. In some species the total number of plications must be taken from mature individuals where the maximum is developed. In less developed specimens the plications might not have reached the surface. This is true of the family in general. Therefore difficulty arises in classifying individuals in genera based on the number of visible plications. For convenience the species have been fitted into the classification of the family as given by Dall and Bartsch in 1904 and 1909.

Subgenus LONGCHÆUS Mörch, 1875[115]

Genotype *P. punctata* Schubert and Wagner. Living. Polynesia.

Pyramidella (Longchæus) larvata Conrad — Plate 7, figs. 31-34; Plate 79, figs. 10, 15

Pyramidella larvata Conrad, 1833, Oct., p. 46; Conrad, 1834, App. in Morton, p. 4; H. C. Lea, 1848, p. 105; Dall, 1892, p. 246; Harris, 1895, p. 24.

[114]Lamarck, J., 1799, p. 76.

[115]Mörch, O. A. L., Malak, Blätt., vol. 22, p. 158, 1875; Schubert, G. H. and Wagner, J. A., in Martini and Chemnitz, Conch. XII, p. 152, 1829, *P. punctata* Schubert and Wagner fide Sherborn.

Acteon elevatus Lea, 1833, Dec., p. 113, pl. 4, fig. 98; H. C. Lea, 1848, p. 95; Harris, 1895, p. 18.

? *Acteon pygmæus* Lea,, 1833, p. 114, pl. 4, fig. 101; H. C. Lea, 1848, p. 95; Dall, 1892, p. 246; Harris, 1895, p. 38 [partim].
Obeliscus larvatus Conrad, 1865, p. 28; Conrad, 1866, p. 14.
? *Obeliscus pygmæus* (Lea) Conrad, 1865, p. 28; Conrad, 1866, p. 14.
? *Odostomia elevata* (Lea) de Gregorio, 1890, p. 156, pl. 15, figs. 18-21.
? *Odostomia pygmæa* (Lea) de Gregorio, 1890, p. 156, pl. 15, fig. 21.
cf. *Pygramidella* (*Obeliscus*) *suprapuchra* de Gregorio, 1890, p. 158, pl. 15, fig. 30; Cossmann, 1893, p. 22.
Pygramidella elevatus (Lea) Dall, 1892, pp. 246, 247 section *Longchæus*.
Syrnola elevata (Lea) Cossmann, 1893, p. 22.
Pyramidella elevata (Lea) Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 216.

Subulate, with nine smooth volutions, indented at the sutures, the indentation margined above by a slightly prominent line; body whorl with a spiral indented line near the middle; fold on the columella prominent.—[Conrad, 1833].

Conrad's description is good. He, as well as later authors, did not mention the occurrance of more than one fold on the columella. Three folds occur on many specimens. The most posterior fold is always present and large. The other two folds are not prominent. The anterior fold may be seen less frequently than the middle one. It is because a third fold does occur although obscure that the species is placed in the present generic and subgeneric groups[116].

The Conrad collection of type material consists of six specimens on a card. The third from the left is chosen as lectotype. The lectotype is uniplicate.

De Gregorio illustrated the species with conspicuous, longitudinal lines over the body whorl. Such a character has been noted on worn specimens only. It would seem as though he had overemphasized the growth lines or had figured worn shells. It is not a specific character.

De Gregorio figured a triplicate *Pyramidella* which he called *suprapuchra*. His figure of *P. larvata* is not representative of the species so that it is difficult to tell whether the illustration of *suprapuchra* is correct. The specimen may be *P. larvata* which shows the three folds on the columella. As illustrated by De Gregorio the two forms differ in the shape of the body whorl and aperture. Neither depict the correct shape of the spire of *larvata*.

Dimensions.—Height, 18 mm.; greatest diameter, 6 mm., lectotype *P. larvata* Conrad; height, 16 mm.; greatest diameter, 6

[116]Dall, W. H. and Bartsch, P., 1904, p. 4; Dall, W. H. and Bartsch, P., 1909, pp. 8, 9.

mm., lectotype *Acteon elevatus* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5545, Acad. Nat. Sci. Phila., lectotype *Acteon elevatus* Lea. Lectotype *Acteon pygmæus* lost not No. 5559, Acad. Nat. Sci. Phila. That specimen becomes *Pyramidella pseudopygmæus* Palmer.

Occurrence.—Gosport sand: locality 104.

Subgenus **ULFA** Dall and Bartsch, 1904[117]

Genotype by original designation *Pyramidella* (*Ulfa*) *cossmanni* Dall and Bartsch = *Syrnola striata* Cossmann non *Acteon striata* Lea. Claibornian Eocene. Southern United States.

Pyramidella (Ulfa) chavani, new species Plate 8, figs. 2, 5, 6, 12, 15, 19, 20

Shell elongate; post-nuclear whorls eight to nine; nucleus heterostrophic, composed of two whorls; first whorl minute, immersed; second whorl enlarged; area excavated above the whorl; surface of whorls obscurely, microscopically, spirally striate; body whorl medially slightly angulated and rounded to the base; basal portion of the body whorl conspicuously, spirally striate; large umbilicus; one columellar fold; outer lip lirate within.

This species differs from *Ulfa cossmanni* Dall and Bartsch in being more elongate with an increase of two or more whorls. In the other characters of the shell the species is very close to *Ulfa cossmanni.* An obsolete, second plication has not been noticed on this species as well as on *cossmanni.*

Named in honor of André Chavan, Licencié Es-Sciences, Nanterre (Seine), France, in appreciation of his examination and notes of several of the Claibornian Cossmann types.

Dimensions.—Height, 8 mm.; greatest diameter, 4 mm.

Syntypes.—Nos. 2724-2730, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 136 and 741. Gosport sand: locality 104.

Section **COSSMANNICA** Dall and Bartsch, 1904[118]

(*Diptychus* Cossmann, 1888 non *Diptychus* Milne Edwards, 1880).

Type by original designation *Pyramidella clandestina* Deshayes. Eocene. Paris Basin.

[117]Dall, W. H. and Bartsch, P., 1904, p. 5; Dall, W. H. and Bartsch, P., 1909, p. 9.
[118]Dall, W. H. and Bartsch, P., 1904, p. 6.

Pyramidella (Ulfa) cossmanni Dall and Bartsch Plate 8, figs. 1, 9, 10

Syrnola (*Orina*) *striata* (Lea) Cossmann, 1893, p. 23, pl. 1, figs. 30-32 [fig. 30 is missdrawn]; non *Acteon striatus* Lea, 1833, p. 114, pl. 4, fig. 100.

Pyramidella (*Ulfa*) *cossmanni* Dall and Bartsch, 1904, Biol. Soc. Wash., Proc., vol. XVII, p. 5 [new name for *Syrnola striata* Cossmann non Lea]; Dall and Bartsch, 1909, U. S. Nat. Mus. Bull. 68, p. 9.

Cossmannica cossmanni (Dall and Bartsch) Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 225, pl. V, figs. 25-27.

C'est une véritable restauration que j'ai du faire pour attribuer ce nom spécifique aux quatre individus que je possède: ils sont en effet ombiliqués et appartiennent certainement au groupe *Orina*, Ad.: mais, comme Lea n'en connaissait qu'un fragment décrit à cause des stries caractéristiques, il est probable qu'il n'aura pas aperçu la perforation ombilicale. C'est une coquille à sommet hétèrostrophe, assez courte, conique, composée d'environ six tours à peine convexes, que sépare une suture étroitement canaliculée; leur surface parait lisse, et les stries ne commencent à apparaitre qu' à la partie antérieure du dernier tour; elles sont beaucoup plus visibles sur la base et autour de l'ombilic, que est perforé en entonnoir étroit, et un peu rétréci par la lame columellaire; celle ci est armée d'un pli assez bas, au dessus duquel est un renflement obsoléte et pliciforme. Il m'a paru intéressant de donner une nouvelle figure de cette rare espèce.

Loc. Claiborne, ma coll. (pl. I, fig. 30-32).—[Cossmann, 1893].

The specimens which Cossmann included under *Syrnola striata* (Lea) were first noted by Dall and Bartsch to be distinct from the *striata* Lea [= *O. alveata* (H. C. Lea)]. The first illustrations which Cossmann gave of his specimens consisted of three figures. One figure (fig. 32) represents a short, conical specimen with an angulated aperture and an angulated body whorl. Another figure (fig. 31) represents the basal portion of the shell showing the umbilicus. The third figure (fig. 30) is of a fragment and illustrates a shell with less oblique sides than fig. 32. The apertures of both drawings are not the same. If figure 30 as drawn, correctly represents the character of the shell, it could not be the same species as that of fig. 32.

Dall and Bartsch, in 1904, noticed that the form which Cossmann called *Syrnola striata* Lea was not the true *striata* of Lea. They renamed Cossmann's species *cossmanni* making it the type for new subgenus *Ulfa*. Cossmann in 1906[119], forgot about the *Syrnola striata* (Lea) Cossmann, 1893, when he stated that he never published a *Syrnola striata*. It is true that he had not made a new species by that name but Dall and Bartsch were simply renaming a misidentified old species. By 1921, Cossmann had straightened out in his mind the procedure of Dall and Bartsch

[119] Cossmann, M., Ann. Soc. Roy. Mal. Belg., tome XLI, p. 213, 1906.

for he gave status to "*Ulfa* Dall and Bartsch, type *Pyramidella cossmanni* Dall [and Bartsch] (= *Syrnola striata* Cossmann).

Cossmann illustrated the species again by photographs in 1921, Essais Pal. Comp., 12 liv., pl. V, figs. 25-27 under the name *Cossmannica cossmanni* Dall. The fragment of figs. 26 and 27 probably the same as fig. 30 of 1893, shows the figure 30 of 1893 to be incorrectly drawn giving an erroneous idea of the shell.

The writer puzzled over the problem of Cossmann's illustrations of *Syrnola striata* (non Lea) and then wrote to André Chavan, Nanterre (Seine), France for verification of Cossmann's types and figures. M. Chavan made a study of the types and generously supplied the following notes:

J'ai constaté, après examen des types conservés dans la collection Cossmann, que Syrnola (Orina) striata, Lea, et Cossmannica (Ulfa) Cossmani, Dall, correspondent au même fossile. Il est renfermé dans un tube, c'est le numéro 11587. Ce tube contient deux specimens de Syrnola, un gros, incomplet, que est le type figuré de Syrnola (Orina) striata, et un petit de la même espèce. L'etiquette de ce tube portait la dénomination "Syrnola (Orina) striata, Lea—type figure.—Claiborne mais Cossmann a raturé par la suite cette dénomination et a écrit au dessus "Ulfa Cossmanni Dall."

Specimens examined of this species and *U. chavani,* n. sp. have a strong plication on the columella. No trace has been seen of the obsolete, second fold which Cossmann describes.

Dimensions.—Height, 4 mm.; greatest diameter, 2.5+ mm., approximate measurements of holotype.

Syntypes.—No. 11587, Cossmann collection, Laboratorie de Géologie de la Faculté des Sciences, Universite' de Paris (Sorbonne).

Occurrence.—Gosport sand: Claiborne, Ala. (Cossmann).

Pyramidella perexilis (Conrad)

Plate 7, figs. 4, 5, 21, 24; Plate 79, fig. 16

Obeliscus perexilis Conrad, 1865, pp. 28, 144, 211, pl, 20, fig. 2; Conrad, 1866, p. 14; Harris, 1895, pp. 33, 38 [synonym *Actæon pygmæus*].
Odostomia perexilis (Conrad) de Gregorio 1890, p. 157, pl. 15, fig. 27.
Syrnola perexilis (Conrad) Dall, 1892, p. 247; Cossmann, 1893, p. 23; Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 228.
Syrnola dalli Cossmann, 1893, p. 22, pl. 1, fig. 28.
Syrnola dalli (Cossmann) var. Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 98, pl. 12, fig. 14 [Sabine Eocene].
Cossmannica dalli Cossmann, 1921, Essais Pal. Comp. 12 liv., p. 221.

Subulate, polished; volutions fourteen; sides straight above and rounded at base; suture deeply channeled; body whorl with slightly concave sides; columella with a prominent plait uniting with the labial deposit.—[Conrad, 1865].

Nuclear whorls of two and a half or three whorls, at right angles to the axis of the shell; first whorl minute, immersed, last whorl enlarged; suture excavated.

There is considerable variation in the character of the plications on the columella. The holotype has one which is not the typical number. Many have one posterior, large fold and a weak second. Others which the author takes to be the condition in *P. dalli* Cossmann have two strong folds, the anterior pronounced. Such is true in the Sabine Eocene forms of the species. A few specimens show internal lirations on the labrum. Usually the inner surface is smooth. One specimen shows a transitional condition with the internal surface smooth except for the formation of a liration. Such being true the few lirate forms are not separated from the species.

The author has included *P. dalli* Cossmann as well as the Sabine (Wilcox) Eocene forms under *P. perexilis* Conrad. Harris[120] suggested such a classification.

Conrad did not state in his original description where the type came from. In his check list of 1865 he gave Alabama as the locality.

The following notes made by André Chavan, after an examination of the types of Cossmann's species of Pyramidellidæ are pertinent to the problem of *P. perexilis* and *dalli*:

La collection Cossmann renfermé encore: *Syrnola Dalli,* Cossm. —de Claiborne. Type figuré, et type de Cossmannica No. 11583.

Syrnola meyeri Cossm. de Jackson, type figure, et *Syrnola propeacicula* de Claiborne.

Turbonilla perexilis, Conrad, qui est un vrai Syrnola, ayant, comme Syrnola meyeri, un seul pli columellaire.

Tous ces spécimens ont malheureusement l'ouverture tres mal conservé surtout les S. perexilis, il y a même parmi eux un Syrnola Dalli typique, ce que ne peut s'expliquer, puisque l'un (perexilis) est caracterisé par un seul pli columellaire a lors que l'autre (Dalli) en a deux. S. meyeri, S propeacicula, S. perexilis sont des Syrnola ''sensu stricto''. Cependant toutes ces especès sont assez voisines (surtout Dalli et perexilis) et il serait intéressant de savoir si le fait d'avoir un seul, ou deux plis, â la columella est un caractère distinctif constant.

Dimensions.—Height, 6.5 mm.; greatest diameter, 1.5 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa Holotype of *P. dalli* (Cossmann) No. 11583, Laboratoire de Géologie de la Faculté des Sciences, Universite' de Paris (Sorbonne). Holotype of *Syrnola dalli* var. in Harris, Cat. No. 1385 Paleontological Research Institution.

[120]Harris, G. D., 1899, ibid, p. 98, pl. 12, fig. 14.

Occurrence.—Sabine Eocene: Woods Bluff, Ala. Lower Claiborne; localities 743, 727, 741 and 756. Gosport sand: locality 104, (type locality of *P. dalli* Cossmann).

Pyramidella pseudopygmæus, new species

Plate 7, figs. 25, 28, 29, 30, 35; Plate 79, fig. 11

Acteon pygmœus museum label No. 5559, A. N. S. Phila., Harris 1895, p. 38 [partim]; nec *Acteon pygmœus* Lea, 1833 nec Dall, 1892, p 246.

Shell large; elongate; usually one, large plication on the columella, few specimens have a small, secondary plication, obliquely formed to the primary fold; lirations on the interior of the whorls back of the line of the outer lip; fine, microscopic, spiral striations over the outer surface; sides of the whorls of this species are less inclined than those of any other described *Pyramidella* from the Claibornian.

The specimen, No. 5559, in the Academy of Natural Sciences at Philadelphia which is labelled *Acteon pygmœus* Lea is not the type of *Acteon pygmœus* Lea. Such identity was questioned by Harris when he catalogued the Lea collection in 1895. The specimen consists of the body whorl and the preceding two whorls. Meyer drew the specimen for *"pygmœus"*. His figure is herein included.

If the figure and description of *A. pygmœus* Lea are compared with the specimen labelled *A. pygmœus,* one sees that they are not the same. The actual type of *A. pygmœus* Lea would be a specimen considerably more oblique. The figure suggests the young of *P. melanella* where it is herein placed. Lea stated that *pygmœus* was less elevated than *striatus.* Extending the line of the sides including the restored apical angle, of both *P. striatus* and the labelled *"pygmœus",* the elevation of *"striatus"* would be about two-thirds that of the labelled *"pygmœus"=pseudopygmœus* which is not in accord with Lea's description.

The Harris collection contains specimens which are the same as the labelled *"pygmœus"* type. The species represented by this material is named *pseudopygmœus,* n. sp. One of the Gosport sand specimens is selected as holotype. The species occurs in the lower Claiborne at Moseley's Ferry, Texas.

Dimensions.—Height, 5+ mm. (fragment); greatest diameter, 2 mm., holotype. Height, 3+ mm. (fragment); greatest diameter, 1.5 mm., specimen No. 5559, Academy of Natural Sciences.

Holotype.—No. 2715; paratypes Nos. 2714, 2717, 2718, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 723. Gosport sand: locality 104 (type).

Pyramidella bastropensis Harris Plate 7, figs. 18, 19, 20

Pyramidella bastropensis Harris, 1895, Acad. Nat. Sci. Phila., vol. 47, p. 76, pl. 8, fig. 9.

Size and general form as shown by the figure; whorls 13 or 14, polished; suture channelled; one sharp strong fold on the columella.

This species resembles to some extent *E. perexilis* Con. but differs from it by being broader at base and more rapidly tapering in the lower four or five whorls.

Locality.—Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

This species is common at Moseley's Ferry, Texas where it occurs in all stages of growth. A perfect specimen in the Harris collection from Smithville, Texas has sixteen post-nuclear whorls.

Typical specimens have been found which possess the strong columellar plication and a small, secondary fold.

This is one of the cases where the individual specimen cannot be used in this family to determine the genus on the number of visible columellar plications.

Some specimens have the interior of the labrum lirate.

Dimensions.—Height, 9 mm., holotype.

Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas. Probably lost.

Occurrence.—Lower Claiborne: localities 723, 727 and 733 (type).

"Eulimella[121] propenotata" de Gregorio Plate 7, figs. 12, 14

Eulimella propenotata de Gregorio, 1890, p. 160, pl. 15, figs. 36-37; Cossmann, 1893, p. 24.

Testa ovato-oblonga, conica, laevigata, nitida; apici spirata, heterostropha; apertura antice rotundata. L. 1. mm.

Cette espèce est très voisine de l'*Eulima notata* Lea, dont je parlerai en suite, mais elle appartient à un autre genre, car ayant étudié mon exemplaire avec attention et avec une forte loupe, je me suis aperçu que son sommet est heterostrophe. D'ailleurs son angle spiral est plus prononcé. Cette espéce est analogue de la *Melania turbinoides* Desh. (Deshayes Coq. Paris pl. 30, fig. 16).—(Coll. mon Cabinet).—[De Gregorio, 1890].

[121]The name *Eulimella* is not used herein because the original reference, Forbes, 1846, Ann. Mag. Nat. Hist., vol. XIV, p. 412, as given by Tryon, Dall and Bartsch does not contain mention of *Eulimella*. Disagreement occurs between authors as to the characters of *Eulimella*. The original reference has not been found.

The shell figured by De Gregorio is 2 mm. in height. In shape it resembles *O. melanella* (Lea), but lacks a columella plication. Cossmann suggested that the shell might be a young specimen in which the fold had not yet developed. The specimen probably belongs with *O. melanella.* Until more data are available the form is left under De Gregorio's name.

Holotype.—De Gregorio home, Via Molo, 132, Palermo, Sicily.

Occurrence.—Presumably Gosport sand: Claiborne, Ala. (De Gregorio).

Subgenus **SYRNOLA** A. Adams, 1860[122]

Genotype by monotypy *S. gracillima* A. Adams. Living. Korea.

Section **PUPOSYRNOLA** Cossmann, 1921[123]

Genotype by original designation *Auricula acicula* Lamarck. Eocene. France.

Pyramidella (Syrnola) propeacicula Cossmann, Plate 7, figs. 1, 2, 3, 10, 11

Syrnola propeacicula Cossmann, 1893, p. 23, pl. 1, fig. 29.
Syrnola propeacicula Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 230 [section *Puposyrnola*].

Testa minuta, angusta, conica, lævigata; apice heterostropho; anfractibus 7 planis, rapide crescentibus, sutura obliqua, lineari discretis; ultimo anfractu elevato, tertiam partem longitudinis superante, ab basim ovoideo; apertura angusta, antice attenuata, plica columellari crassa et prominula.

Petite coquille étroite et conique, médiocrement allongée composée, outre l'embryon hetérostrophe, de sept tours lisses assez élevés, croissant rapidement, séparés par des suture obliques et linéaires. Dernier tour grand, ovale à la base, dépassant le tiers de la hauteur de la coquille, quand on le mesure de face jusqu'à la suture inférieure; ouverture petite, étroite, aténué du côté antérieur; columelle portant un gros pli saillant et transversal.

Longueur, 4 mill.; diamètre, 1 mill.

Cette espèce est extrêmement voisine de *S. acicula*, Lamk. et ne s'en distingue que par sa forme un peu moins subulée, et par l'absence de stries spirales sur les tours de spire. Elle ne peut être confondue avec aucune des espèces précèdentes et elle doit être extrèmement rare, car je n'en ai trouvé qu'un seul individu dans 150k de sable.

Loc. Claiborne, ma coll. (pl. I, fig. 29).—[Cossmann, 1893].

Shell small, slender, sides of the whorls straight suture pronouncedly depressed; nucleus minute, composed of two and a half or three whorls, first partly emmersed; a revolving groove occurs on the upper portion of the whorl just below the suture; whorls seven to ten; aperture elongated, rounded at the base; true umbilicus not present; outer margin of the columella sometimes slightly projecting; slight concave area in the middle of each whorl; one large plication of the columella; lirations obscure or absent on the outer lip.

[122]Adams, A., Ann. Mag. Hist., 3d. ser. vol. 5, p. 405, 1860.
[123]Cossmann, M., Essais Pal. Comp., 12 liv., p. 229, 1921.

Eroded specimens of this species occur in the Orangeburg, S. C. material. The sutural groove is commonly worn. This gives a deceiving appearance to the shells.

At Moseley's Ferry, Texas, numerous, immature specimens occur which belong to the same species as that found at Orangeburg, S. C. The young from both localities have been compared. They belong to the species which the author is identifying as *Syrnola propeacicula* Cossmann. The young specimen in the Moseley's Ferry material may be easily confused with the young of *Odostomia trapaquara* (Harris) and the young of *Pyramidella perexilis* Conrad. The young shells of *P. perexilis* are narrower with straighter sides than the shells of relative age of *S. propeacicula* which in turn are more elongate and less convex in outline than *O. trapaquara*. When the young stages are compared the generic distinction between *O. trapaquara* and *S. propeacicula* is not apparent. Harris[124] suggested the two species might be the same. The author believes the two species to be distinct but that their generic classification may be close. Tentatively Cossmann's species is left as he classified it. André Chavan, who kindly examined the type of *S. propeacicula* Cossmann writes that it is a "Syrnola sensu stricto".

Dimensions.—Height, 7 mm.; greatest diameter, 2 mm.

Holotype.—Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Occurrence.—Lower Claiborne: localities 139, 707, 708 and 723. Gosport sand: locality 104 (type).

Genus **TURBONILLA** Risso, 1826[125]

Genotype by subsequent designation *Turbonilla plicatula* Risso 1826=*T. typica* Dall and Bartsch,[126] nec *Turbo plicatus* Brocchi, 1814 nec *Turbo plicatus* Montagu. Recent. Mediterranean.

Turbonilla bidentata (Meyer) Plate 8, fig. 3

Odostomia bidentata Meyer, 1886, Bull. Geol. Sur. Ala., No. 1, pt. II, p. 70, pl. 1, fig. 3; de Gregorio, 1890, p. 158, pl. 15, fig. 28.

Turbonilla (*Pyrolamprus*) *bidentata* (Meyer) Cossmann, 1893, p. 24; Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 288.

Subulate, whorls eight; nucleus and first whorl smooth, elsewhere furnished with transverse ribs; suture impressed; base rounded, smooth; columella with a very prominent oblique fold, and a second indistinct one below it. *Locality.*—Claiborne, Ala.

[124]Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 99, 1899.

[125]Risso, A., 1826, vol. 4, p. 224.

[126]Dall, W. H. and Bartsch, P., 1904, p. 7; Dall, W. H. and Bartsch, P., 1909, p. 29 [*plicate* Risso].

The ribs have in one of the three specimens a tendency to become obsolete, especially toward the lower part of each whorl. The lower fold will be better seen in fragments, with exposed columella, than in a perfect mouth.—[Meyer, 1886].

Dimensions.—Height, 4- mm., holotype.

Holotype.—Not found.[127]

Occurrence.—Gosport sand: Claiborne, Ala. (Meyer).

Turbonilla neglecta Meyer Plate 8, figs. 4, 11

Turbonilla neglecta Meyer, 1886, Bull. Geol. Sur. Ala., No. 1, pt. II, p. 69, pl. 1, fig. 4; de Gregorio, 1890, p. 159, pl. 15, figs. 31-32; Cossmann, 1893, p. 24; Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 279.

Subulate; whorls flattened, closely covered with broad and distinct transverse ribs, ending rather abruptly on the last whorl and leaving the base smooth; aperture subquadrangular, longer than broad; inner lip twisted, thus forming an obtuse fold at some distance from the sharp outer lip; crenulate within by a few distant elevated spiral lines.

Locality.—Claiborne, Ala.—[Meyer, 1886].

Dimensions.—Height, 2.5 mm., holotype.

Holotype.—Not found.[128]

Occurrence.—Gosport sand: Claiborne, Ala. (Meyer).

Subgenus **PTYCHEULIMELLA** Sacco, 1892[129]

Genotype by subsequent designation, Dall and Bartsch, 1904,[130] *Tornatella pyramidata* Deshayes.[131] Pliocene. Italy.

Turbonilla (Ptycheulimella) sabina, new species Plate 8, fig. 7

Shell medium, elongate; post-nuclear whorls eleven, suture distinct, excavated; whorls equally rounded above and below the suture; nuclear whorls consist of three whorls, the axis of which is at right angles to that of the post-nuclear whorls; first, two nuclear whorls minute and protrude beyond the plane of the coil, third whorl enlarged; on the first post-nuclear whorl there are microscopic, longitudinal ribs which do not completely cover the whorl. Such a character is typical of the subgenus.

There is a trace of a columellar fold.

As was discussed under *Melanella tenua* (Gabb) this species

[127]Search was made at the Geology Department, Johns Hopkins University, Baltimore, Md., and at the Alabama Museum of Natural History, University, Ala.

[128]Search was made at the Geology Department, Johns Hopkins University, Baltimore, Md., and at the Alabama Museum of Natural History, University, Ala.

[129]Sacco, F., I Molluschi dei Terreni Terziarii del Piemonte e della Liguria, pt. XI, Eulimidae e Pyramidellidae (parte) p. 59, 1892.

[130]Dall, W. H. and Bartsch, P., 1904, p. 7.

Eulimella tenua Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 97, [partim], pl. 12, fig. 16; non *Eulima tenua* Gabb, 1860..

[131]Deshayes, G. P., Exped. scientif. de la Morée, tome III, p. 154, pl. XXIV, figs. 29-31, 1832 fide Sacco, 1892.

is the Sabine Eocene form included by Prof. Harris under Gabb's species.

This species differs from *Melanella tenua* (Gabb) in having a more elongate spire but the base of the body whorl and the aperture are shorter.

The nucleus of *Melanella tenua* (Gabb) is as yet unknown. That of *Turbonilla sabina,* n. sp. is a typical *Turbonilla.*

As recorded by Cossmann[132] *Ptycheulimella* has not been reported before below the Miocene.

Dimensions.—Height, 9 mm.; greatest diameter, 3 mm., holotype.

Holotype.—No. 1386, Paleontological Research Institution.

Occurrence.—Sabine (Wilcox) Eocene: Woods Bluff, Ala.

Genus **ODOSTOMIA** Fleming, 1817[133]

Genotype by subsequent designation, Gray, 1847,[134] *Turbo plicatus* Montagu. Recent. Great Britain.

Odostomia carolina, new species Plate 7, fig. 16

Shell small, elongate, composed of four, smooth whorls; nuclear whorls, oblique, immersed; suture impressed; aperture elongate; large tooth on columella; inner lip slightly flaring anteriorly.

This species is distinct in shape from the other Claibornian species of *Odostomia.* It is more slender. The shape suggests that of *Aclis modesta* Meyer but it is not as attenuated as that shell. The presence of the tooth places the species in a different family than that of *Aclis modesta* Meyer.

Dimensions.—Height, 3.5 mm.; greatest diameter, 1.5 mm., holotype.

Holotype.—No. 2710, Paleontological Research Institution.

Occurrence.—Claibornian: locality 136.

Odostomia trapaquara (Harris) Plate 7, figs. 26, 27

Syrnola trapaquara Harris, 1895, Proc. Acad. Nat. Sci. Phila., p. 77, pl. 8, fig. 10; cf. Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 99, pl. 12, fig. 15.

cf. *Odontostomia insignifica* Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 179, pl. 2, fig. 8.

Size and general form as indicated by the figure; whorls 7; 1 small, sinistral; 2-7 polished, slightly tumid, with a wellmarked suture; aperture moderate, striate within; one strong plait on the columella.

132Cossmann, M., Essais Pal. Comp., 12 liv., p. 304, 1921.
133Fleming, John, Edinburgh Encycl., vol. 7, pt. 1, p. 76, 1817.
134Gray, J. E., 1847, p. 159.

Localities.—Smithville, Bastrop Co.; Jones' farm, Hurricane Bayou, Houston Co., and in Mr. Singley's collection from Mosley's Ferry.
Geological horizon.—Lower Claiborne Eocene.
Type.—Texas State Museum.—[*Harris*, 1895].

This species is common at locality 727, two and one-half miles above Stone City, Little Brazos River, Texas, lower Claiborne, Crockett formation. The distinction between the young of this species and associated species is brought out under *Syrnola propeacicula* Cossmann.

Harris regarded in 1899, the Sabine Eocene species *O. insignifica* Aldrich as this same species. The illustration of *O. insignifica* suggests a form with a shorter spire. Specimens of *O. insignifica* have not been examined for comparison.

Dimensions.—Height, 4 mm.; greatest diameter, 1.5 mm.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—cf. Sabine Eocene. Lower Claiborne Eocene: localities 723, 724, 727 and 741.

Odostomia lævis (H. C. Lea) Plate 7, fig. 9

Acteon lævis H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 94, pl. 1, fig. 4; H. C. Lea, 1848, p. 95; de Gregorio, 1890, p. 157, pl. 15, fig. 24 non fig. 25.
Odontostomia lævis (H. C. Lea) Cossmann, 1893, p. 24.

A. testâ subulatâ, politâ, lævi, tenui; spirâ valdè elevatâ; anfractibus —, planulatis; suturis impressis; columella uniplicatâ; aperturâ quadrilaterali.
Shell subulate, smooth, polished, thin; spire very elevated; whorls—, flat; sutures impressed; columella with one fold; mouth quadrilateral.
Length—. Breadth .05 of an inch.
Remarks.—This interesting little species somewhat resembles *A. elevatus*, Lea, but differs from it in having but one fold on the columella, in the shape of the mouth, and in size. The fold on the columella is unusually large for so small a shell. It is the most subulate Actæon that I have seen.—[*H. C. Lea*, 1841].

Type.—Probably lost.

Occurrence.—Gosport sand: Claiborne, Ala. (H. C. Lea).

Subgenus **EVALEA** A. Adams, 1860[135]

Genotype by subsequent designation, Dall and Bartsch, 1904,[136] *Evalea elegans* A. Adams. Living. Japan.

Odostomia (Evalea) melanella (Lea)
Plate 7, figs. 13, 15, 17, 22, 23; Plate 79, fig. 6

Acteon melanellus Lea, 1833, p. 113, pl. 4, fig. 99; H. C. Lea, 1848, p. 95; Harris, 1895, p. 27.
Actæon melanellus (Lea) Conrad, 1834, App. in Morton, p. 4; Dall, 1892, p. 247.

[135]Adams, A., Ann. Mag. Nat. Hist., 3d. ser. vol. 6, p. 22, 1860.
[136]Dall, W. H. and Bartsch, P., 1904, p. 12.

Actæon magnoplicatus H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 94, pl. 1, fig. 5; Harris, 1895, p. 27.
Acteon magnoplicatus H. C. Lea, 1848, p. 95.
Obeliscus melanellus (Lea) Conrad, 1865, p. 28; Conrad, 1866. p. 14.
Odostomia lævigata Heilprin, 1879, Acad. Nat. Sci. Phila., Proc., vol. 31, p. 212, pl. XIII, fig. 5; Meyer, 1887, Bericht, Senck. natur. Gesell., p. 18.
Odostomia melanellus (Lea) de Gregorio, 1890, p. 157, pl. 15, figs. 22, 23.
Odostomia magnoplicatus (H. C. Lea) de Gregorio, 1890, p. 157, pl. 15, fig. 26.
Odontostomia melanella (Lea) Cossmann, 1893, p. 23, pl. II, fig. 4.
cf. *Odontostomia pygmæa* (Lea) Cossmann, 1893, p. 23, pl. II, fig. 5.
Odontostoma magnoplicatus (H. C. Lea) Dall, 1892, p. 247.

Shell subulate, smooth; substance of the shell rather thick; spire elevated, pointed; suture sharply impressed; columella with a single large fold; whorls six, flattened; mouth ovate, outer lip simple.

Length 7-20ths, Breadth 3-20ths, of an inch.

Observations.—This small species has some resemblance to the last described, [*O. elevatus*] but differs in size, in the number of folds, and in being without a furrow.—[*Lea,* 1833].

Nucleus is minute and heterostrophic. The suture is deeply impressed.

Conspicuous lirations are present on the inside wall of the whorls but they do not extend to the outer margin of the outer lip. Considerable variation is seen in the presence of lirations on the interior of the labrum. More specimens lack lirations. Some show a few. Specimens under the microscope show minute, spiral striæ over the exterior surface of the whorls. The striations occur on specimens typical of *O. melanella* as well as specimens which are slenderer and which Lea designated as "*Acteon*" *striatus*=*O. alveatus.*

The specimen No. 5550, which is labelled as type of *O. melanella* in the Academy of Natural Sciences at Philadelphia is not the type of the species. Harris questioned the specimen as the type when he catalogued the Lea collection. Meyer drew the specimen as the type and it is included herein as an illustration of the species. The type specimen is probably lost.

Lea gave the measurements for the species as 7-20ths of an inch in length. Such is the length of the figure given by Lea. The specimen No. 5550 A. N. S. is only 7 mm. in length.

The type of "*Actæon*" *magnoplicatus* H. C. Lea is a fragment 2 mm., greatest diameter. When the apical angle and height of the shell is reconstructed, the form appears the same as *O. melanella* (Lea). The Meyer drawing of the holotype of "*A.*" *magnoplicatus* is herein included.

The holotype of *O. lævigata* Heilprin has been examined. The specimen is a fragment measuring 7 mm., height and 4+ mm., greatest diameter. It is also labelled "*Acteon striatus*" Lea. When the height of the shell is reconstructed, the form corresponds to *O. melanella* Lea. Meyer made such a conclusion in 1887.

Dimensions.—Height, 10+ mm.; greatest diameter, 5 mm.

Lectotype.—Probably lost. Holotype of *Actæon magnoplicatus* H. C. Lea is No. 13158, Academy of Natural Science, Philadelphia, Pa. Holotype of *Odostomia lævigata* Heilprin is 10076-1, 5557-1,[137] American Museum of Natural History, New York, N. Y.

Occurrence.—Lower Claiborne: locality 708. Gosport sand: locality 104 (type).

Odostomia (Evalea) melanella alveata (H. C. Lea)

Plate 7, figs. 6-8; Plate 79, fig. 18

Acteon striatus Lea, 1833, p. 114, pl. 4, fig. 100; H. C. Lea, 1848, p. 95; Harris, 1895, p. 43 [partim]; non *Acteon striatus* Sowerby, 1824.
Acteon alveatus H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 94 [new name].
Obeliscus ? striatus (Lea) Conrad, 1865, p. 28; Conrad, 1866, p. 14.
Odostomia striata (Lea) de Gregorio, 1890, p. 158, pl. 15, fig. 29.
Odontostomia striatus (Lea) Dall, 1892, p. 247.
non *Syrnola* (*Orina*) striata Cossmann, 1893, p. 23, pl. 1, figs. 30-32.

Shell subulate, polished, minutely and transversely striate; substance of the shell rather thin; suture deep and sharp; columella with a single large fold; whorls—, flattened.

Length . . . . Breadth .1, of an inch.

The smaller figure is of the size of nature.

Observations.—But a fragment of this species has come under my observation, and the figure represents it with its broken mouth and spire. There is enough of the remains to distinguish it from those before described. It most resembles the last, [*A. melanellus*] but differs in being striate, and is apparently more attenuate in the spire, which I presume is very acute.—[Lea, 1833].

The Meyer drawing of the holotype of *A. striatus* Lea is included. Meyer drew the specimen from the same aspect as the original Lea figure. The specimen is broken and both illustrations are misleading as they are drawn from the side and not from a direct apertural view. Such a view as Lea's and Meyer's gives an unnatural idea of the shell. When the shell is oriented to the right and the lines of the sides projected to an apex, the shell has the appearance of *O. melanella* Lea but differs in being narrower and more elevated. There are faint striations on *alveata* as on *melanella*. Both have a strong plication. Some specimens show

[137] Whitfield, R. P. and Hovey, E. O., 1901, p. 456.

internal lirations on the labrum.

Since *O. melanella* and *O. alveata* differ only in shape, *alveata* is designated herein as a variety of *melanella*. Possibly if larger collections of the species were available, variations in form would show the two to be the same.

Dimensions.—Height, 8 mm.; greatest diameter, 3.5 mm.

Holotype.—No. 5558, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Subgenus **PYRULINA** A. Adams, 1864[138]

Genotype by subsequent designation,[139] *Chrysallida casta* A. Adams. Living. China Sea.

Odostomia (Pyrgulina) claibornensis Aldrich Plate 6, fig. 7

Odostomia (Pyrgulina) claibornensis Aldrich, 1911, Bull. Amer. Pal., vol. V, No. 22, p. 9, pl. IV, fig. 1.

Dimensions.—Height, 3.5 mm., holotype.

Holotype.—Not found.[140]

Occurrence.—Gosport sand: Claiborne, Ala. (Aldrich).

Cossmann, 1893, p. 24 believed he had an individual shell from Claiborne which was the *Odostomia Boettgeri* Meyer[141] from the Vicksburg Oligocene.

Turbonilla (Chemnitzia) trigemmata Conrad, 1860=*Compsopleura trinodosa* Conrad, 1865=*Goniobasis trigemmata* which see.

Family **MATHILDIIDÆ**

Genus **Mathilda** Semper, 1865[142]

Genotype by original designation, *Turbo quadricarinatus* Brocchi. Pliocene. Italy.

Several species of *Mathilda* occur in the southern American Eocene. The genus is fairly common in the Paris Basin Eocene. Dall[143] described a species of the genus from the Miocene of Jamaica. Numerous species occur off the Atlantic coast from

[138]Adams, A., Jour. Linn. Soc. London (Zool.), vol. VII, p. 4, 1864.

[139]Dall, W. H. and Bartsch, P., 1904, p. 11; Dall. W. H. and Bartsch, P., 1909, p. 14.

[140]Search was made at the Geology Department, Johns Hopkins University, Baltimore, Md., and at the Alabama Museum of Natural History, University, Ala.

[141]Meyer, O., Acad. Nat. Sci. Phila., vol. 39, p. 51, pl. III, fig. 4, 1887.

[142]Semper, O., Jour. de Conch., vol. 13, p. 330, 1865.

[143]Dall, W. H., Proc. U. S. Nat. Mus., vol. 19, p. 320, pl. 29, fig. 5; Woodring, W. P., 1928, p. 406, pl. 32, figs. 7, 8 *M. plexita* Dall.

North Carolina south[144].

The genotype is from the Pliocene of Italy and species occur in the present fauna of the Mediterranean. *M. elegantula*[145] lives in Australia at Port Jackson while *M. sinensis* Fischer[146] is reported from the Island of Chusan, China Sea.

Mathilda retisculpta (Meyer and Aldrich) Plate 9, fig. 2

Eglisia retisculpta Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour., vol. IX, No. 2, p. 42, pl. II, fig. 9.

Mathilda retisculpta (Meyer and Aldrich) Cossmann, 1893, p. 30.

Spire subulate. Whorls regularly rounded. Covered with five elevated, flattened longitudinal lines, crossed by numerous oblique, flattened, transverse ribs, smaller in size. Aperture elliptical.

Wautubbee.—[Meyer and Aldrich, 1886].

Meyer used longitudinal lines in the sense of spiral. Cossmann suspected that the species belonged to *Mathilda* although he did not have the evidence. Several specimens of a variety of the species which have the nucleii well preserved are contained in the Harris collection from the Orangeburg district of South Carolina. The nucleii are typical embryonic whorls of *Mathilda*. The nucleus is heterostrophic, consisting of about three whorls. This species differs from the other species of *Mathilda* in the southern Eocene Basin by having the longitudinal or axial lines more strongly developed. On the other species there are merely lines that cut the spiral interspaces but do not cross the revolving ribs. On *M. retisculpta* the crossing of the longtiudinal lines on the spiral ribs gives a reticulate appearance to the surface. The longitudinal lines do not occur over the lower portion of the body whorl.

The holotype has five, spiral ribs on the penultimate whorl and thirteen, spiral ribs on the body whorl.

Dimensions.—Greatest diameter, 6 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Wautubbee, Miss. (Meyer and Aldrich).

Mathilda retisculpta aldrichi, new variety Plate 9, figs. 11, 14

Shell medium in size, elongate; nucleus heterostrophic consisting of three whorls, first whorl minute, last whorl enlarged; post-

[144]Johnson, C. W., 1934, p. 104.

[145]Angas, George F., Proc. Zool. Soc. Lond., p. 14, pl. 1, fig. 8, 1871; de Boury, E., Jour. de Conch., vol. 31, p. 116, 1883.

[146]Fischer, P., Jour. de Conch., vol. 15, p. 304, pl. IX, fig. 3, 1867; de Boury, E., ibid, vol. 31, p. 123, 1883.

nuclear whorls coarsely ornamented with spiral and longitudinal ribs which at their intersections form nodes. There are five, spiral ribs on the whorls of the spire and ten, spiral ribs on the body whorl. The longitudinal ribs become obscure at about the sixth, spiral rib on the body whorl. The remaining, spiral ribs on the body whorl are not nodose. The aperture is ovate.

This variety is like *M. retisculpta* in general sculpture. Both have five, spiral ribs on the whorls of the spire. The variety *aldrichi* has fewer spiral ribs on the body whorl. The variety differs from the typical form in having coarser, nodose sculpture.

M. retisculpta aldrichi has five or six whorls. The number of typical *M. retisculpta* is not known.

Dimensions.—Greatest diameter, 6 mm. (spire broken). Height, 10 mm.; greatest diameter, 5 mm., holotype.

Holotype.—No. 2742; paratype No. 2741, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 707 and 708 (type).

Mathilda claibornensis Aldrich Plate 9, fig. 1

Mathilda claibornensis Aldrich, 1887, Cincinnati Soc. Nat. Hist., Jour. July, vol. X, No. 2, p. 83.

Tuba (*Mathilda*) *claibornensis* Aldrich, 1895, Bull. Amer. Pal., vol. I, No. 2, p. 15, pl. 1, fig. 7.

Shell very minute, embryonic whorls three, and placed as usual in the genus, the adult whorls, (but three remaining in the type) with three rounded smooth ring like bands, the intervening spaces having impressed longitudinal lines which do not pass over the bands.

Locality: Claiborne Ferruginous Sand.

Very rare, but the second species known from this famous deposit.—[Aldrich, 1887].

The type of the species is an immature specimen but shows the particular characters of *Mathilda*. The shell might be the young of *M. regularis* (Meyer) which has the same type of spiral ribs and longitudinal lines crossing the spiral interspaces but not the ribs. However, on close examination of figures of both species one sees that on the young whorls of *regularis* there are three, large, spiral ribs with a fourth (first above), much smaller in size. On *claibornensis* there are only two, large ribs with a smaller third rib (first above).

The nucleus of the holotype is tilted to the plane of the postnuclear whorls at about an angle of 45°. This is more than is shown by the illustration.

Dimensions.—Height, 1.75 mm.; greatest diameter, 1+ mm.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala. (Aldrich).

Mathilda regularis (Meyer) Plate 9, fig. 7

Eglisia regularis Meyer, 1886, Geol. Sur. Ala., Bull. No. 1, pt. II, p. 68, pl. II, fig. 3.

Mathilda regularis Meyer, 1887, Bericht Senckenb, natur. Ges. für 1886, p. 5, pl. I, fig. 12; Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 6, pl. 1, figs. 1a, b, c.

Whorls rather rapidly increasing in size, regularly rounded; covered by four sharp elevated revolving lines, the uppermost of which is the smallest; the interstices with numerous transverse riblets, which in connection with the revolving lines give to the surface an almost cancellate appearance.

Locality.—Red Bluff, Miss.—[Meyer, 1886].

Meyer originally described this species from the Oligocene. He later discovered a Jackson specimen with the nucleus which revealed the *Mathilda* character. The late T. H. Aldrich wrote that he found the species in the Gosport sand.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand Eocene to Red Bluff Oligocene. Red Bluff, Miss. (type locality).

Genus **Tuba** Lea, 1833[147]

Genotype by subsequent designation Cossmann, 1888[148], *T. alternata* Lea=*T. antiquata* (Conrad). Claibornian. United States.

Tuba was created by Lea for three species *striata, alternata* and *sulcata* without a designation of type. Authors following Conrad in 1865, have regarded the three as synonymous. On examination of the types, *sulcata* is found to be a young specimen of *Ranellina maclurii* (Conrad). *Tuba striata* and *T. alternata* are not identical.

Cossmann, in 1888, designated *alternata* as the type of *Tuba*. This was previous to Dall's[149] statement that *T. striata* Lea was the type of the genus. Dall thought *striata, alternata* and *sulcata* synonymous. *T. alternata* Lea is a synonym of *T. antiquata* (Conrad). Conrad's species becomes the type of the genus.

[147]Lea, I., 1833, p. 127.
[148]Cossmann, M., 1888, p. 312.
[149]Dall, W. H., 1892, pp. 318, 320.

Tuba antiquata (Conrad) Plate 9, figs. 12, 13; Plate 79, figs. 17, 19

Littorina antiquata Conrad, 1833, Sept., p. 35; H. C. Lea, 1848, p. 100; Harris, 1895, p. 5.
Meleagris antiquatus Conrad, 1834, App. in Morton, p. 4.
Tuba alternata Lea, 1833, p. 128, pl. 4, fig. 118; H. C. Lea, 1848, p. 106; Cossmann, 1888, Soc. Roy. Mal. Belg. Ann., tome XXIII, 4th ser. tome III, p. 312; Cossmann, 1893, p. 30; Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 14, pl. I, fig. 17.
Tuba antiquata Conrad, 1865, p. 34 [partim]; de Gregorio, 1890, p. 142, pl. 13, figs. 15-17 [partim under *Turbo*]; Dall, 1892, p. 320 [partim under *T. striata* Lea]; Aldrich, 1897, Bull. Amer. Pal., vol II, No. 8, p. 7, pl. 4, fig. 7; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 77, pl. 10, fig. 12 [partim].
non *Tuba striata* Lea, 1833, p. 128, pl. 4, fig. 117.
non *Tuba sulcata* Lea, 1833, p. 129, pl. 4, fig. 119 [=*Ranellina maclurii* (Conrad) young].

Shell conic-acute, somewhat ventricose, with numerous revolving, very elevated lines, alternating with smaller ones, and longitudinal, approximate, regular striæ; sutures deeply impressed; whorls convex; umbilicus distinct, rounded; mouth orbicular, slightly contracted by the rotundity of the penultimate whorl. Length ½ an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

The nucleus consists of one large, smooth whorl, inclined at about 45° to the plane of the shell, restricted by a cord at the formation of the post-nuclear whorls. The sculpture of the post-nuclear whorls begins immediately with four, sharp, spiral ribs with longitudinal threads subordinate for about one-fourth of a whorl.

The sculpture of the adult is formed early and changes little in character in the later history of the individual. The immature shells of two or three whorls have the mature sculpture developed.

There are four, sharp, major revolving ribs with wide interspaces on the whorls of the spire. In the interspaces there is an intermediate, revolving thread, with sometimes a finer third and fourth, spiral line. Crossing the spiral ribs are fine, longitudinal lines which give the revolving ridges a beautiful, nodose character.

The Conrad type collection of *T. antiquata* consists of two specimens. The type is the smaller of the two. The holotype of *T. alternata* Lea is a young specimen of *T. antiquata.*

T. antiquata differs from *T. striata* Lea in retaining a greater inequality in the size of the spiral ribs. The alternating ribs in *T. striata* increase in size until the spiral ribs appear nearly equal. The difference between the two forms is clearly shown by the Meyer drawings of the types and by the illustrations given herein of additional specimens.

T. antiquata s. s. and the varieties *striata* and *texana* represent extremes in sculptural development. Intermediate variations occur. For this reason the conspicuous variations are not separated as distinct species. The species originated in the Sabine Eocene of Alabama.

Dimensions.—Height, 14 mm.; greatest diameter, 10 mm., lectotype *T. antiquata* Conrad. Height, 8 mm.; greatest diameter, 5.5 mm., holotype *T. alternata* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; holotype *T. alternata* Lea, No. 5659, A. N. S.

Occurrence.—Sabine (Wilcox) Eocene: Woods Bluff, Ala. Lower Claiborne: localities 707, 708, 723 and 731. Gosport sand: locality 104 (type).

Tuba antiquata striata Lea Plate 9, figs. 15-18; Plate 79, fig. 8

Tuba striata Lea, 1833, p. 128, pl. 4, fig. 117; Cossmann, 1893, p. 30.

Shell elevated above, rounded below, thickly covered with transverse striæ cut by minute longitudinal striæ; substance of the shell rather thick; apex not acute; suture impressed; umbilicus very small; whorls six, inflated; mouth nearly round, striate within, one-third the length of the shell; outer lip crenate.

Length 7-20ths, Breadth .2, of an inch.

Observations.—A beautifully ornamented and certainly very interesting shell. It is closely filled with transverse rounded striæ, having the appearance of cords, the middle one of which is rather the largest. The cutting striæ are somewhat imbricate. Single specimens only of this and the two following species have come into my possession. This species more strongly resembles the *Turbo sculptus* of Sowerby, than the following species do.—[Lea, 1833].

This shell described by Lea at the same time as *alternata* has been regarded by authors since Conrad so listed, as the young or the same as *alternata* (*antiquata* Conrad). An examination of the types of Lea's and Conrad's shells reveals that while *antiquata* has consistently four, primary, spiral ribs on the whorls of the spire, *striata* has six on the penultimate whorl. The spiral ribs are more uniform in size and do not have the conspicuous, alternating, transverse ribs as in *antiquata*. The type specimens of the two species of Lea are practically of the same size and number of whorls so that *striata* could not be the young of *alternata* as suggested by Conrad.

At localities where the species is abundant as Moseley's Ferry, Texas considerable variation is seen in the size of the spiral ribs. *T. striata* represents accelerated growth in the secondary, spiral ribs which become equal or nearly so to the primary ribs. Such a condition slightly changes the outline of the whorls to a more regularly rounded shape than that of *T. antiquata* s. s.

As far as the type specimens are concerned the margin of the inner lip or *striata* is not overturned and flared obliquely so much as in *antiquata* (*alternata* Lea).

Dimensions.—Height, 9 mm.; greatest diameter, 6 mm., holotype.

Holotype.—No. 5658, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 136, 707, 708, 723, 734 and 741. Gosport sand: locality 104 (type).

Tuba antiquata texana, new variety Plate 9, figs. 8, 9

Tuba (*Littorina*) *antiquata* Heilprin, 1891, p. 400 [probably partim].
Tuba antiquata var. *texana* Harris, Texas MS.

Shell large, spire high for the species; whorls six; nucleus typical; sculpture of the post-nuclear whorls consists of four, strong, primary ribs, the first and fourth smaller than the two middle ribs; two, middle, spiral ribs increased in size making the whorls of the spire bicarinate; three to six, fine, thread-like, spiral ribs occur between the primary ribs; all crossed by longitudinal threads which at the intersection form a node; below the strong bicarination of the body whorl nine to eleven, spiral ribs occur to the base; one or more, spiral threads alternate with the primary series.

This species differs from *T. antiquata* s. s. and the variety *striata* in being more elevated in the bicarination of the whorls and by the greater number of fine, thread-like spirals.

Prof. Harris pointed out, in his Texas Eocene manuscript, this variation which occurs in Texas material. He gave the name *texana*. Although the name was never published, workers so labelled specimens. To save confusion if a new name were added, Prof. Harris's name is retained.

Dimensions.—Height, 17 mm.; greatest diameter, 10 mm., holotype. Height, 11 mm.; greatest diameter, 8 mm., paratype. Height, 15 mm.; greatest diameter, 8 mm., paratype.

Holotype.—No. 2743; paratypes Nos. 2744, 2745, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 733.

Tuba cancellata (H. C. Lea) Plate 9, figs. 3, 4, 5, 6, 10; Plate 79, fig. 13

Pasithea cancellata H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 93, pl. 1, fig. 2; H. C. Lea, 1848, p. 103; Harris, 1895, p. 9.
Actæonema striata Conrad, 1865, p. 147, pl. 11, fig. 2 non *Pasithea striata* Lea, 1833, p. 102, pl. 4, fig. 83.
Eglisia pulchra Meyer, 1886, Geol. Sur. Ala., Bull. No. 1, pt. II, p. 67, pl. I, fig. 16.
Scalaria (*Eglisia*) *pulchra* (Meyer) de Gregorio, 1890, p. 132, pl. 12, fig. 1.
Pyramis striata (Conrad) de Gregorio, 1890, p. 161, pl. 15, fig. 39 [partim]; non Cossmann, 1893, p. 29.
Tuba cancellata (H. C. Lea) Dall, 1892, pp. 320, 341.
Rissoa cancellata (H. C. Lea) de Gregorio, 1890, p. 132, pl. 12, fig. 9.
Mathilda pulchra (Meyer) Cossmann, 1893, p. 30.

P. testâ turritâ, subtenui, politâ, imperforatâ, cancellatâ; apice acutâ; anfractibus —, convexis; sutures profundis; columellâ lævi; aperturâ subellipticâ.

Shell turrited, somewhat thin, polished, imperforate, cancellate; apex acute; whorls —; convex; sutures deep; columella smooth; mouth subelliptical.

Length .3, Breadth .15 of an inch.

Remarks.—It is probable that this beautiful little species attains a greater size, as I have a fragment of a specimen, the breadth of which is .2 of an inch; it may therefore be regarded as the largest species of this genus from Claiborne. The mouth is rounded below and angular above, and about .1 of an inch in length. The transverse striæ are larger than the longitudinal ones, and make the whole surface of the shell beautifully cancellate.—[H. C. Lea, 1841].

The original figure of this species is poor. The Meyer drawing of the lectotype is excellent. It is included herein. The lectotype is an immature specimen as Lea suggested. The adult shell is more elevated and the sutural area more excavated.

There are five, wide, spiral ribs with narrow interspaces on the whorls of the spire. Eleven to thirteen, spiral ribs occur on the body whorl depending on the size of the shell. Longitudinal striæ cross the spiral ribs and give a cancellate or punctate appearance to the surface. The species has the nucleus of *Tuba*. The shell is slender like the species of *Mathilda*. It has the same number of spiral ribs as *M. retisculpta*. *T. cancellata* differs in the character of the nucleus and the character of the sculpture. *M. retisculpta* and the variety *aldrichi* have the longitudinal ribs developed in greater strength so that as in *aldrichi* nodes are formed. In *T. cancellata* the longitudinal sculpture is finer, forming threads which are conspicuous in the interspaces. On the young specimens or on the first whorls of the spire, fine nodes may be formed.

When the figure and description of *Eglisia pulchra* is compared to this species there is a remarkable similarity and the two species are placed together. Both came from the Gosport sand at Claiborne.

Tuba marylandica Clark and Martin[150] from the Sabine and Claibornian (Aquia and Nanjemoy stages) Eocene of Maryland is a similar type of shell. *T. marylandica* is slenderer and has a greater number of revolving ribs.

Dimensions.—Height, 7 mm.; greatest diameter, 4 mm., holotype. Height, 7 mm. *Eglisia pulchra* Meyer, holotype.

Lectotype.—No. 13167, Academy of Natural Sciences, Philadelphia, Pa.; *Eglisia pulchra* Meyer, holotype, Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: locality 104.

Tuba sulcata Lea, 1833, p. 129, pl. 4, fig. 119 is not a *Tuba* but the young of *Ranellina maclurii* (Conrad). Aldrich[151] made note of the types. The name is preoccupied by *Tuba sulcata* (Pilkington), 1804, from the Bartonian of England.

Tuba antiquata var. *texana* in Kennedy, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 122 is a nomen nudum. The name is used and the variety is described herein.

Tuba antiquata var. *antiqua* in Kennedy, 1895, Acad. Nat. Sci., Phila., Proc. vol. 47, p. 128 is a nomen nudum.

Family EPITONIIDÆ

Genus **Epitonium** (Bolten) Roeding, 1798[152]

Genotype by subsequent designation Suter, 1913[153], *Turbo scalaris* Linné. Living. Western Pacific.

"Epitonium" jacobi, new species — Plate 10, figs. 2, 3, 4

Shell small, delicate, needle-like; whorls ten not including the nucleus; nucleus consists of about two smooth whorls, first whorl enlarged; second whorl angulate; post-nuclear whorls begin immediately with the sharply ribbed sculpture; ornamentation consists of sixteen, sharp, prominent, longitudinal ribs, which are interrupted just below each suture by a concave area; the longi-

150 Clark, W. B. and Martin, G. C., Md. Geol. Sur. Eocene, p. 155, pl. XXIX, fig. 2, 1901.
151 Aldrich, T. H., Bull. Amer. Pal., vol. I, No. 2, p. 15, 1895.
152 Roeding, P. F., (Bolten, J. F.), 1798, p. 91.
153 Suter, H., 1913, p. 319.

tudinal ribs become spinose at the margin of the concave area and project over it; surface of the shell smooth; base of body whorl carinated, the longitudinal ribs do not extend anteriorly beyond the carination; not umbilicated; outer lip broken.

The elongate form with greater number of whorls, the smooth concave area of the whorls angulated below with the spinose, longitudinal ribs differentiates this species from the other species of the Epitoniidæ of the Eocene of the southern embayment. The proper generic determination is left for the future.

Dimensions.—Height, 5 mm.; greatest diameter, .75 mm., holotype.

Holotype.—No. 2750; paratype No. 2751, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 741.

Subgenus **Elegantiscala** de Boury, 1910[154]

Genotype by original designation, *S. elegantissima* Desh. Eocene. Paris Basin.

Epitonium (Elegantiscala) aldrichi (de Boury) Plate 10, fig. 9

*Scala (Elegantiscala*Q, new sp. Alabama, de Boury, 1910, Jour. de Conch., vol. 58, p. 216.

Scala (Elegantiscala) aldrichi de Boury, 1912, l. c., vol. 60, p. 318, pl. 11, fig. 16.

S. testa valde fracta. Testa mediocriter solida. Sutura valde profunda, modice aperta, nullo modo perforata. Anfr. valde convexi costis axialibus parum elevatis, parum obliquis, parum crassis, crispatis et ad partem superiorem obtuse subspinosis ornati, inter costas funiculis crassiusculis 6 vel 7, supra costas ascendentibus et antecurrentibus impressi. Aliquando costæ in parvulas varices mutantur. Anfr. ult. costis 20 præditus. Basis funiculo circumscripta. Apertura omnino fracta.

Long. fragm.: 25 *mm.; diam. maj.*: 12 *mm.; alt. max. anfr. circiter*: 14 *mm.*

Terrain.—Eocène.

Localité.—Alabama: Collections de l'Ecole des Mines à Paris, Type unique.

Coquille très mutilée, dont il ne reste guère que trois tours, mais dont les caractères sont très tranchés. Le test est médiocrement épais comme chez les autres *Elegantiscalla*. La suture est très profonde et moyennement ouverte. Elle n'est nullement alvéolée. Les tours très convexes sont ornés de côtes très peu obliques, peu épaisses, moyennement élevées et crépues. Ces côtes sont obtusément épineuses vers leur sommet. L'épine est sutuée assez loin de la suture vers laquelle elle se recourbe. Entre les côtes on observe deux sortes de cordons transverses: les uns assez gros au nombre de 6 ou 7, les seconds beaucoup plus fins et serrés recouvrant toute la coquille, y compris les cordons principaux. Tous partent de la base de la côte pré-

[154] de Boury, E., Jour. de Conch., vol. 58, p. 216, 1910.

cédente et remontent sur les côtes suivantes jusqu 'a leur bord externe. Ils se dirigent du côtè de l'ouverture, c'est-à-dire qu'ills sont antécurrents. Les côtes deviennent parfois légèrement variqueuses et se composent alors de deux feuillets accolés au lieu de un. On compt e environ 20 côtes sur le dernier tour. L'ouverture est cassée.

Rapports et différences.—Cette coquille ne manque pas d'analogie avec le *S. elegantissima* Desh. et appartient incontestablement au même sous-genre. Toutefois, sa sculpture est encore bien plus prononcée. Ses côtes sont moins nombreuses: 20 au lieu de 23 pour le *S. elegantissima*, qui est cependant bien plus étroit. Les cordons transverses, au nombre de 8, sont bien plus apparents et bien plus saillants que sur l'espèce parisienne. Chez le *S. elegantissima* les cordonnets secondaries sont bien plus faibles et les cordonnets verticaux qui les rendent granduleux sont bien plus apparents. Les cordonnets secondaires et les petits cordons verticaux sont à peu près d'égale grosseur. Chez le *S. Aldrichi*, au contraire, les cordonnets transverses sont très développés, tandis que les cordons verticaux, quoique visibles, sont bien moins apparents. Les cavités rectangulaires formées par les côtes et les cordons transverses principaux du *S. elegantissima* sont très nets, tandis qu 'ils sont plus obsolètes chez le *S. Aldrichi*. Enfin, la suture de ce dernier est bien plus profonde, ses varices sont moins fortes et son épine est moins rapprochée de la suture.—[De Boury, 1912].

Unfortunately De Boury did not know the Eocene horizon or locality in Alabama from which this species came. At least nothing further than Eocene, Alabama is given with his description. The collections examined by me have not afforded any specimen like it. The reference is included in hope the locality and horizon may be traced.

Holotype.—Collection of l'Ecole des Mines, Paris.

Epitonium (Elegantiscala) kingæ, new species Plate 8, figs. 22, 23

Shell small, post-nuclear whorls seven; nucleus elongate, whorls four, first minute, smooth, other three enlarged with longitudinal ribs; post-nuclear whorls sculptured with longitudinal, lamellar ribs, crossed by from four to six, spiral ribs, the longitudinal ribs predominating; body whorl with seven, spiral ribs; basal portion of body whorl with spiral ribs only.

This species is distinct from any of the other Claibornian species of Claibornian Epitoniidæ. It is remarkably similar in shape and sculpture to the specimen of the recent *E.* (*Elegantiscala*) *arabica* Nyst[155] from the Red Sea figured by De Boury[156]. *E. kingæ* is a small species only 4 mm., in height while *E. arabica* is 50 mm., in height. *E. arabica* is composed of a greater number of whorls.

[155]Nyst, H. J. P., Ann. Soc. Mal. Belg., vol. VI, p. 92, 1871, new name for *Scalaria decussata* Sowerby non Lamarck.

[156]de Boury, E., Jour. de Conch., vol. 60, p. 278, pl. X, fig. 5, 1912.

Named in honor of Mrs. Helen King Hodson.

Dimensions.—Height, 4 mm.; greatest diameter, 1 mm.

Holotype.—No. 2731, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 741.

Genus **Cirsotrema** Mörch, 1852[157]

Genotype by monotypy *Scalaria varicosa* Lamarck. Living. Western Pacific.

Subgenus **Coroniscala** de Boury, 1909[158]

Genotype by original description *S. coronalis* Deshays. Eocene. Paris Basin.

Cirsotrema (Coroniscala) nassula (Conrad) Plate 10, figs. 12-14, 18, 21-23; Plate 80, figs. 5, 9

Scalaria nassula Conrad, 1833, Sept., p. 31; Conrad, 1834, App. in Morton, p. 4 [partim]; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 340, [interchanged with *sessilis*]; Conrad, 1854, in Wailes' Geology Miss., pl. 16, fig. 6 [as *nassuta*]; Conrad, 1855, Acad. Nat. Sci. Phila., Proc., vol. 7, p. 261 [non figures]; de Gregorio, 1890, p. 131; Harris, 1895, p. 29.
Scalaria carinata Lea, 1833, Dec., p. 116, pl. 4, fig. 102 [non 103 as cited by Lea].
? *Scalaris quinquefasciata* Lea, 1833, Dec., p. 116; Harris, 1895, p. 38.
Cirsotrema megaptera Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser., vol. IV, p. 401, pl. 68, fig. 1.
Scala (*Cirsotrema*) ? *nassula* Conrad, 1865, p. 28; Conrad, 1866, p. 15.
"*Scalaria Cirsotrema bella* Conrad?" specimens labeled in Academy Natural Sciences; Harris, 1895, p. 7 [nomen nudum].
Scala (*Opalia*) *carinata* (Lea) de Gregorio, 1890, p. 129 [partim].
Scala planulata de Gregorio, 1890, p. 128 [partim], pl. II, fig. 29.
Scalaria (*Cirsotrema*) *carinata* (Lea) Cossmann, 1893, p. 24 [partim].
Scalaria carinata (Lea) Harris, 1895, p. 10 [partim].
Cirsotrema (*Coroniscala*) *carinata* (Lea) Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 54.
Cirsotrema (*Coroniscala*) *megaptera* (Gabb), Cossmann, 1912, ibid, p. 54.
non *Scala carinata* Clark and Martin, 1901, Md. Geol. Sur. Eocene, p. 154, pl. 28, fig. 12.

Shell elongated, with eight ventricose, transversely grooved whorls, and numerous delicate costæ, about twenty of which are on the body whorl; basal margin carinated. Length ¾ of an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

This species differs from the other described Claibornian Cirsotremas in having a larger number of longitudinal ribs. The number of ribs probably varies by several ribs more than the number originally mentioned by Conrad.

The status of this species is greatly confused by not having been figured early by Conrad. The validity of this species has

[157]Mörch, O. A. L., 1852, p. 49.
[158]de Boury, E., 1909, p. 255.

been placed in doubt by authors, but it is a distinct species. Comparing the types of several species, one finds that they fall in synonymy with *nassula* Conrad.

The Conrad type material consists of two specimens from Claiborne, Ala. Conrad listed and figured the species in 1854 among the Jackson forms from Jackson, Miss. In error, probably, he spelled the name *nassuta*. In 1855, he stated that the Jackson shells were larger but agreed with the Claibornian. There is the possibility that the Jackson and Claiborne forms are not the same. In that case, the Jackson specimens require a new name.

S. carinata Lea is a young specimen of *S. nassula* Conrad. Fortunately the type of *S. nassula* Conrad is a complete specimen. The lectotype of *S. carinata* Lea has fewer longitudinal ribs but when compared with the same growth stage of *S. nassula,* the two forms have a similar shape, same number of longitudinal ribs with the longitudinal ribs crossed by obscure, spiral lines.

Unfortunately the original figure of *S. carinata* Lea and that of *S. planulata* Lea were mixed in the text and explanation. This together with the fact that nearly all of Conrad's species of *Epitonium* were not figured has led to authors confusing the Claibornian species of the Epitoniidæ.

Lea explains the difference between *carinata* and *planulata* explicitly. In *carinata* the longitudinal ribs continue beyond the basal carina, to the peristome. In *planulata* the longitudinal costæ only extend to the basal carina. De Gregorio did not make the correction of figures in regard to the two species hence he has the two forms interpreted wrongly in his monograph. *"Scalaria" venusta* H. C. Lea, *"S." sessilis* Conrad, *"S." staminea* Conrad and *"S." nassula* Conrad are placed in synonymy by De Gregorio and others. The descriptions of *venusta* and *staminea* definitely state that the longitudinal ribs do not extend beyond the basal cord. Authors have probably followed Conrad of 1865, in placing *sessilis* Conrad and *carinata* Lea as equivalent. Conrad did not figure *sessilis*. The Meyer type drawing of the species shows no longitudinal ribs below the basal carina.

C. nassula is one of several of the Claibornian Epitoniidæ which have the longitudinal costæ prolonged beyond the basal disk and the ends folded into a "twisted fringe" or "bourrelet" against the columellar border. Over the lower margin of the "bourrelet" the margin of the peristome projects in the form of an ear or "auricle". The basal cord on close examination can be seen to be discontinuous at the intersection of each costæ and the cord. The cord is made up of a series of projections from each rib, extending backward to the left margin of the preceding rib. They occur in regular, linear sequence which gives the appearance of a continuous line.

The *S. quinquefasciata* Lea was never figured. The specimens, Nos. 5568 and 5569 at the Academy of Natural Sciences are probably not the type material. Harris questioned the specimens as types of the species when he catalogued the material. The Meyer drawing of the more perfect specimen, No. 5569 is included herein. It has more longitudinal ribs than that described by Lea. It is an adult shell. Specimen No. 5569 is typical *C. nassula* (Conrad). Whether the real *S. quinquefasciata* Lea belongs also to *nassula* is a question.

There are two specimens in the collections at the Academy of Natural Sciences labelled *S. Cirsotrema bella* Con. ?. This name was never described. The specimens are *C. nassula* (Conrad).

The type material of *Cirsotrema megaptera* Gabb at the Academy of Natural Sciences is composed of four specimens, with an old label which states type and a label which states "*megaptera* =*S. nassula* Conrad". A definite Alabama locality is not given.

Dimensions.—Height, 21 mm.; greatest diameter, 9 mm., lectotype *"S." nassula* Conrad. Height, 10 mm.; greatest diameter, 4 mm., lectotype *"S." carinata* Lea. Height, 19 mm.; greatest diameter, 9 mm., No. 5569, A. N. S. Height, 30 mm.; greatest diameter, 12 mm., "*S. Cirsotrema bella* Con. ?"

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Claiborne Eocene; Gosport sand: locality 104 (type). ? Jackson Eocene.

Cirsotrema (Coroniscala) claibornensis (Conrad) Plate 10, fig. 1

Scala (Cirsotrema) claibornensis Conrad, 1865, pp. 28, 211, pl. 20, fig. 12; Conrad, 1866, p. 15; Harris, 1895, p. 11 [partim].

Scalaria (Cirsotrema) claibornensis (Conrad) de Gregorio, 1890, p. 131, pl. 12, fig. 6.

Cirsotrema (*Coroniscala*) *clairbornensis* (Conrad) Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 54.

Whorl with profoundly elevated acute reflexed ribs; interstices with revolving, large, intermediate, fine striæ ex.ending to t.e base.

Locality.—Claiborne, Alabama.—[Conrad, 1865].

Conrad's description of this species is brief and the holotype consists of the body whorl only. The longitudinal ribs are more robust than shown on Conrad's illustration. Harris suggested that *C. claibornensis* is synonymous with *C. nassula* (Conrad). The types of the two species are adult shells. Comparing the two, *C. nassula* has a larger number of longitudinal costæ.

Dimensions.—Height, 16 mm. (broken); greatest diameter, 15 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Cirsotrema (Coroniscala) octolineata (Conrad) Plate 10, figs. 17, 20, 24

Scala octolineata Conrad, 1860, Acad. Nat. Sci. Phila., Jour., 2d ser., vol. IV. p. 294.

Scala (*Cirsotrema*) *octolineata* Conrad, 1865, p. 28.

Scalaria octolineata (Conrad) Aldrich, 1885, Cincinnati Soc. Nat. Hist., Jour., vol. 8, p. 153, pl. 3, fig. 22; Aldrich, 1886, Geol. Sur. Ala., vol. 1, p. 34, pl. 1, fig. 22; Dall, 1896, Nautilus, vol. IX, p. 112.

Scalaria Spillmanni Aldrich, 1885, ibid, p. 154.

Scala octolineata (Conrad) Aldrich, 1897, Bull. Amer. Pal., vol. II. No. 8, pl. 4, figs. 6, a.

Cirsotrema octolineata (Conrad) Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 52.

Turrited; whorls longitudinally costate; ribs distant, very prominent, laminar; revolving lines distant, prominent, continued over the right sides of each varix, the other side rugose; varices very prominent; base with a carina.

Length about 1½ inches.

Locality.—Mississippi. Dr. Spillman.—[Conrad, 1860].

This species was not figured by Conrad. Aldrich published the same illustration in two different papers, of a specimen which he received from Dr. Spillman and which he regarded as *octolineata*. Aldrich's specimen came from Enterprise, Miss., and he miswrote when he gave the age as Jacksonian. Aldrich figured another specimen from Clark County, Alabama.

This species has from sixteen to twenty, longitudinal ribs. The varices are strong and developed at alternate intervals on the whorls.

The holotype of this species was not found. The specimens figured herein are similar to that figured by Aldrich.

Dimensions.—Height, 18 mm.; greatest diameter, 9 mm.

Holotype.—Probably lost.

Occurrence.—Lower Claiborne: locality 731; Enterprise, Miss. (Aldrich) Gosport sand: locality 104.

Cirsotrema (Coroniscala) lintea (Conrad)
Plate 79, fig. 4, Plate 10, figs. 15, 19

Scala lintea Conrad, 1860, Acad. Nat. Sci. Phila., Jour., 2d. ser., vol. IV, p. 294; H. C. Lea, 1848, p. 105; Conrad, 1865, p. 27; Conrad, 1866, p. 14; de Gregorio, 1890, p. 130.

Turrited; whirls ventricose, broad on the body whirl and rapidly tapering to the apex; ribs numerous, not close, rising near the suture into subspinous foliations; revolving lines smooth, unequal, rugose.
Length 1¼ inches.
Locality.—Claiborne, Ala.—[Conrad, 1860].

This species is distinct in its shorter length with the broad body whorl, absence of conspicuous varices and the greater foliation of the longitudinal lamellæ.

The species has not been figured heretofore. An excellent drawing of the type by Meyer is included herein. De Gregorio suggested the species was synonymous with "*S.*" *planulata* Lea but there is no relationship or similarity between the two forms. "*S.*" *planulata* is a *Rudiscala.*

Dimensions.—Height, 28 mm.; greatest diameter, 17 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport Sand: locality 104.

Cirsotrema (Coroniscala) newtonensis (Meyer and Aldrich)
Plate 10, figs. 10, 11

Scalaria Newtonensis Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. vol. IX, p. 41, pl. II, fig. 8.
Parviscala newtonensis (Meyer and Aldrich) Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 36.
?*Parviscala newtonensis* (Meyer and Aldrich) de Boury, 1917, Jour. de Conch., vol. 63, p. 35.

Whorls regularly rounded, gradually diminishing in size. They are covered by very fine revolving lines, which on the middle of the whorls are arranged in bands, about five in number. The very prominent transverse ribs, about nine on each whorl, are lamellar, angularly produced above; their margin is reflected to the right. The fine revolving lines continue on their right side. The left side, however, is sharply defined from the surface of the whorls. The ribs continue over the base, which is defined by an elevated carina. Aperture circular.
Newton.—[Meyer and Aldrich, 1886].

This species differs mainly from the other Claibornian species in having a reduced number of longitudinal costæ. Cossmann placed the species under *Parviscala,* the type of which is *Scala algeriana* Weinkauff. *Parviscala* lacks the basal carina on the body whorl. The description of *newtonensis* definitely states that an "elevated carina" occurs on the body whorl. De Boury doubted that *C. newtonensis* was a *Parviscala.*

Dimensions.—Height, 14 mm., (incomplete); greatest diameter, 9 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Newton, Miss. (type) and locality 731.

Genus **SCALINA** Conrad, 1865[159]

(*Ferminoscala* Dall, 1908)[160]

Genotype herein designated *Scala staminea* Conrad. Claibornian Eocene. United States.

Conrad gave the new name *Scalina* to the subgenus under which he placed two species. He and subsequent authors never designated one of the species as type. Dall, in 1908, described the subgenus *Ferminoscala,* which has the characters Conrad referred to *Scalina.* The author agrees with Woodring[161] that many of the European and American species described as *Acrilla,* belong in *Ferminoscala*=*Scalina.*

Scalina staminea (Conrad) Plate 8, fig. 16

Scalaria staminea Conrad, 1860, Acad. Nat. Sci. Phila., 2d. ser. Jour., vol. IV, p. 294; de Gregorio, 1890, p. 130 [partim)]; Harris, 1895, p. 42; ?Heilprin, 1891, p. 400.

Scala (*Scalina*) *staminea* Conrad, 1865, p. 27; Conrad, 1866, p. 14.

Subulate; whirls regularly rounded; ribs and revolving lines closely arranged, very fine; base carinated; below the carina ribs obsolete.
Locality.—Claiborne, Alabama.—[Conrad, 1860].

The holotype consists of three whorls. The whorls are regularly rounded, with cancellate sculpture; there are ten or eleven, spiral ribs crossed by longitudinal ribs of equal strength; the body whorl is carinated at the base with fine, cancellate sculpture below the carination. The aperture is broken. The whorls are more convex than those of *S. trigintanaria* (Conrad) of the Vicksburg Oligocene, to which it is related.

[159]Conrad, T. A., 1865, p. 27.
[160]Dall, Wm. H., 1908, p. 315, pl. 8, fig. 8.
[161]Woodring, W. P., 1928, p. 402.

Through the courtesy of Miss Helen Winchester, Academy of Natural Sciences, the illustration of the type of this species is included.

Dimensions.—Height, 15 mm.; greatest diameter, 8 mm.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Scalina trapaquara (Harris) Plate 8, figs. 24, 26, 29-31

Tenuiscala trapaquara Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 76, pl. 8, fig. 7.

Size and general form as shown by the figure; whorls 12 or more; nuclear 4 smooth and polished; 5-11 traversed by fine sharp longitudinal costæ and numerous spiral lines, the latter consisting of five coarse lines occupying the medial and basal portions of the whorl and as many microscopic lines on a subsutural zone; body whorl generally but imperfectly preserved, sculpturing as in the whorls immediately above, the base, however, being exposed, shows from 12 to 15 strong spiral lines.

Localities.—Moseley's Ferry, Brazos River, Burleson Co.; Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Additional specimens have been found of *S. trapaquara* which indicate that as the individuals increase in age the whorls become less convex and the spiral ribs on the posterior part of the whorls decrease in size.

Specimens are figured herein from the Claibornian of Louisiana, the exact locality information of which has been lost. They show the mature development excellently and are the only specimens available.

Dimensions.—Height, 16 mm.; greatest diameter, 5.5 mm., fragment medium size specimen.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 136, 138, 723, and 733.

Scalina trapaquara engona (Harris) Plate 8, figs. 21, 25

Tenuiscala trapaquara engona Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 76, pl. 8, fig. 8.

Slightly shorter, more angulated, and with a broad subsutural band without strong revolving striæ.

Locality.—Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 731 and 733 (type).

Scalina trapaquara adamsi, new variety Plate 8, figs. 27, 28

Shell large, elongate; parietal callus thin, inner lip bent backward; fasciole obscure; sculpture consists of longitudinal, fine lines crossed by slightly coarser, spiral ribs forming a reticulate structure; longitudinal lines irregularly slightly varicose; lower four spiral ribs on the whorls enlarged and form the convex portion of the whorls; close-set, equal, finer lines occur between the primary spirals over the whole surface of the whorl; on the holotype just below the suture a group of three, finer spirals with wider interspaces occur, there are six, large, primary ribs on the body whorl, the lowermost makes a basal carina below which both the revolving and axial ribs are reduced to threads; where the longitudinal lines and the primary, spiral ribs cross, slight nodes are formed; between the longitudinal, primary ribs are microscopic striations; apical whorls unknown.

The apical whorls and outer lip are broken on the only specimen.

This shell is related to *S. trapaquara* (Harris) and *S. trigintanaria* (Conrad). It differs from the first in not having the revolving ribs enlarged over the full height of the whorl. On *trapaquara* the revolving ribs consist of five or six larger, primary lines regularly spaced over the whole whorl with wide interspaces. On *trapaquara adamsi* the primary, spiral ribs are confined to the lower two-thirds of the whorl and the spiral lines on the upper portion of the whorl are not enlarged. On *S. trigintanaria* (Conrad)[162] of the Vicksburg Oligocene the primary, revolving ribs occur over the full height of the whorl but there are three or four ribs more on the whorls than on the whorls of *S. trapaquara* and its varieties.

The close relationship of this variety and *S. trapaquara* is seen on mature specimens of *trapaquara* where the spiral ribs on the posterior portion of the whorls tend to decrease in size and the whorls become less convex. In *S. trapaquara adamsi* the spiral ribs below the suture are reduced in size to that of the secondaries.

The variety is named in honor of John E. Adams, of Midland, Texas, who collected the specimens.

[162]Conrad, T. A., Acad. Nat. Sci. Phila., 2d. ser. Jour., vol. I, p. 114, pl. 11, fig. 14, 1848.

Dimensions.—Height, 23 mm. (incomplete); greatest diameter, 9 mm., holotype.

Holotype.—No. 2737, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 727.

Genus **ACRILLOSCALA** Sacco, 1890[163]

Genotype by subsequent designation, De Boury, 1909[164], *Turbo geniculatus* Brocchi.

Pliocene. Italy.

Acrilloscala, sp. Plate 10, fig. 8

An imperfect specimen from the lower Claibornian near Linwood, 11 miles from Rusk, Angelina County, Texas, reveals unique characters. The specimen is too badly eroded to describe as new but enough of the characters are present to indicate that the species is distinct. The shell is small with convex whorls. The whorls were covered with fine, close-set, spiral lines which were crossed on the whorls of the spire by low, longitudinal ribs. The axial ribs become obsolete on the body whorl. Irregular varices occur. The varix on the body whorl is conspicuously enlarged. Judging from the presence of the angulation of the mold of the whorl at the base, the body whorl was carinated.

Resemblance to denuded whorls of the spire of *Calyptraphorus velatus* (Conrad) may confuse the *Acrilloscala* with that form. The presence of varices on the *Acrilloscala* will separate the two.

Dimensions.—Height, 14 mm. (incomplete); greatest diameter, 5 mm.

Specimen figured.—No. 2753, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 758.

Genus **RUDISCALA** de Boury, 1909[165]

Genotype by original designation *S. rudis* Philippi. Oligocene. Germany.

Rudiscala sessilis (Conrad) Plate 10, fig. 16; Plate 79, figs. 3, 5, 12, 14

Scalaria sessilis Conrad, 1833, Nov., p. 45; Conrad 1834, App. in Morton, p. 4; H. C. Lea, 1848, p. 105; non d'Orbigny, 1850, p. 340 [interchanged with *S. nassula*]; Harris, 1895, p. 41.

[163]Sacco, F., Cat. pal. Bac. terz. Piem. No. 5251, 1890; Sacco, F., I Molluschi dei terreni terziarii del Piemonte e della Liguria, p. 86, 1891.
[164]de Boury, E., Jour. de Conch., vol. 57, p. 256, 1909.
[165]de Boury, E., 1909, p. 256.

Scalaria planulata Lea, 1833, Dec., p. 115, pl. 4, fig. 103 non fig. 102; H. C. Lea, 1848, p. 105; de Gregorio, 1890, p. 128 [partim]; Cossmann, 1894, p. 24; Harris, 1895, p. 35.

Scalaria elegans H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 95, pl. 1, fig. 6 [young]; H. C. Lea, 1848, p. 105; de Gregorio, 1890, p. 129, pl. 11, fig. 39 [partim]; nec *S. elegans* Risso, 1826, Hist. Nat. de l'Europe Merid., IV p. 113 nec d'Orbigny, 1846-47.

?*Scalaria venusta* H. C. Lea, 1841, April, Amer. Jour. Sci., vol. XL, p. 95, pl. 1, fig. 7; H. C. Lea, 1848, p. 105; Harris, 1895, p. 47, nec Münster, 1841, nec Libassi, 1859.

Scala (*Opalia*) *sessilis* Conrad, 1865, p. 27, [partim]: Conrad, 1866, p. 14.

Scala planulata (Lea) Conrad, 1865, p. 27; Conrad, 1866, p. 14.

Scala sessilis (Conrad) Clark and Martin, 1901, Md. Geol. Sur. Eocene, p. 154, pl. XXVII, fig. 11.

Scala (*Bifidoscala*) *planulata* (Lea) de Boury, 1910, Jour. de Conch., vol. 58, p. 220.

Acrilloscala (*Bifidoscala*) *planulata* (Lea) Cossmann, 1912, Essais Pal. Comp. 9, liv., p. 67.

Subulate, with rather thick longitudinal costæ, and minute crowded spiral lines; whorls nine, sessile or contiguous; base of the body whorl carinated.—[Conrad, 1833].

The Conrad type material consists of two specimens. The more perfect specimen of the two which is the specimen on the right side of the type card is chosen as lectotype.

The holotype of *S. planulata* Lea has been examined. It is a typical *S. sessilis* Conrad. Conrad had made such a classification as is indicated by his labels. Both of the type specimens of *S. sessilis* and *S. planulata* have fine, close microscopic, spiral lines.

Lea has the figures of *planulata* and *carinata* interchanged on the original plate as is evidenced by a comparison with the description of each. This mistake confused authors as to the true identity of each species.

There are seven longitudinal ribs on the body whorl of the lectotype of *S. elegans* H. C. Lea. It is a young specimen of *S. sessilis* Conrad.

The lectotype of *S. venusta* H. C. Lea has been examined. It is close to *S. sessilis* and may be the same species.

The Meyer drawings of the types of *S. sessilis* Conrad, *S. planulata* I, Lea, *S. elegans* H. C: Lea and *S. venusta* H. C. Lea are included herein.

This species is characterized by the prominent, longitudinal ribs, base carinated but the longitudinal ribs do not cross the basal carina. For that reason the author does not agree with De Boury[166] and Cossmann[167] that the species belongs with *Acrillo-*

[166]de Boury, E., Jour. de Conch., vol. 58, p. 220, 1910.

[167]Cossmann, M., Essais Pal. Comp., 9 liv., p. 67, 1912; de Boury, E., ibid, vol. 63, p. 45, 1917.

scala and *Bifidoscala.*

Clark and Martin figured a fragment from the Aquia formation (Sabine), 2 miles below Potomac Creek, Md., which is probably *sessilis.* Their specimen is figured without microscopic, spiral lines. This occurrence lowers the range of the species.

Dimensions.—Height, 15 mm.; greatest diameter, 5.5 mm., lectotype *S. sessilis* Conrad. Height, 10 mm.; greatest diameter, 5 mm., holotype *S. planulata* I. Lea. Height, 3.5 mm.; greatest diameter 1 mm., lectotype *S. elegans* H. C. Lea. Height, 12 mm., lectotype *S. venusta* H. C. Lea.

Lectotype.—*S. sessilis* Conrad, Academy of Natural Sciences, Philadelphia, Pa.; holotype *S. planulata* I. Lea, No. 5560, A.N.S.; lectotype *S. elegans* H. C. Lea, No. 13177, A.N.S.; lectotype *S. venusta* H. C. Lea, No. 13176, A.N.S.

Occurrence.—Sabine Eocene: Aquia formation, Md. (Clark and Martin). Gosport sand: Claiborne, Ala. (type).

Rudiscala harrisi, new species — Plate 8, fig. 18

Scala sp. Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 96, pl. 12, fig. 8; non *Epitonium multiliniferum* Aldrich, 1921, Bull. Amer. Pal., vol. IX, No. 37, p. 11, pl. 1, fig. 16.

Shell small, elongate; whorls nine including the nucleus; nucleus consists of two and a half smooth whorls; the whorls are ornamented with prominent, longitudinal costæ with irregular varices; last varix is continuous with the margin of the labrum giving a thickened, crenulated flare to the lip; surface of the whorls covered by fine, wide striations which cross the longitudinal ribs; fine interspaces of the spiral lines when examined under the microscope show a definite, punctate character; longitudinal costæ end below the middle of the body whorl at a basal carina; below the basal carina the spiral lines continue; slight groove in the umbilical region; sixteen to eighteen, longitudinal ribs on the body whorl; mouth round.

Aldrich, in 1921, thought that the shell of Harris might be a young example of a new species *multiliniferum* Aldrich. The two forms are distinct. There are about twice as many longitudinal ribs on Aldrich's species. *R. harrisi* is more varicose.

This species is remarkably like the figure by Von Koenen[168]

[168]von Koenen, A., Paleontographica, 16 Bd., p. 109, pl. II (VII), figs. 6a, b, c, 1867.

of "*Scalaria rudis* Philippi" from the middle Oligocene of North Germany. Von Koenen's shell is apparently not typical *S. rudis* Philippi which is the type of *Rudiscala* de Boury. Sacco[169] in 1891 gave the varietal name *Koeneni* to the *rudis* of Von Koenen. De Boury[170] discussed the various references to *rudis*. He described the form from the middle Oligocene of Freienwalde as new, *Rudiscala secernenda*. This species had been included by Von Koenen under *rudis*. The sculpture of *R. secernenda* is strikingly of the character of *harrisi*. The species has a greater number of whorls while *R. rudis* von Koenen var. *koeneni* Sacco has the same number of whorls as our Eocene form.

Cossmann in 1912 in the Essais Pal. Comparée included *Rudiscala* under *Turriscala* de Boury. De Boury[171] however, in his critical review of Cossmann's work on the family points out the difference between the two subgenera. *Rudiscala* does not have the basal, spiral cord or carina double as in *Turriscala*.

The *Scalaria funiculata* Watson,[172] (=*S. Watsoni* de Boury,[173] non *S. funiculata* Carpenter, 1857) living off Pernambuco appears from the illustration to belong to this group.

The *Epitonium dakotense* Stanton[174] from the Cannonball marine part of the Lance formation in North Dakota probably belongs to *Rudiscala*.

In sculpture of the ribs and basal carina these species resemble numerous forms of the Cretaceous and Eocene *Confusiscala* de Boury, 1909, type *Scalaria Dupiniana* d'Orbigny.[175] The aperture and base are different on *Confusiscala*. That genus was world wide in distribution throughout the Cretaceous and Midway Eocene. References are given in Cossmann, 1912, p. 74. The range of the genus as given by Cossmann should be extended to include the Midway Eocene. The Marie Farinha beds,

[169]Sacco, F., I Molluschi terreni terziarii del Piemonte e della Liguria, pt. IX, p. 76, 1891.

[170]de Boury, E., Jour. de Conch., vol. 60, p. 307, pl. XI, fig. 9, 1912.

[171]de Boury, E., Jour. de Conch., vol. 63, p. 48, 1917.

[172]Watson, R. B., Jour. Linn. Soc. Lond., vol. XVI, p. 609, 1883; Watson, R. B., Challenger Rept., Zoology, vol. XV, p. 141 pl. IX, fig. 4, 1886; Tryon, G., Man. Conch., vol. IX, p. 75, pl. 18, fig. 79, 1887.

[173]de Boury, E., Jour. de Conch., vol. 61, p. 111, 1913.

[174]Stanton, T. W., U. S. Geol. Sur., Prop. Paper 128-A., p. 35, pl. VI, figs. 9a, 9b, 1921.

[175]d'Orbigny, A., Pal. Française, Ter. Cretacés, vol. 2, p. 54, pl. 154, fig. 10-13, 1842-43.

Brazil, which contain *Confusiscala gardneri* are Midway Eocene instead of Cretaceous as originally placed by White[176].

Although this species does not belong in the Clabornian fauna, the opportunity is taken to name this fine specimen and point out its relationships. It is named in honor of G. D. Harris.

Dimensions.—Height, 5 mm.; greatest diameter, 2 mm.

Holotype.—No. 1380, Paleontological Research Institution.

Occurrence.—Sabine Eocene: Woods Bluff, Ala.

Genus **PLICISCALA** deBoury, 1887[177]

Genotype by original designation, *P.* (*Scalaria*) *Gouldi* Deshayes. Eocene. Paris Basin.

Subgenus **CYLINDRISCALA** de Boury, 1909[178]

(*Torquatiscala* de Boury, 1912.)

Genotype by original designation *S. fulgens* de Boury= *Scalaria acus* Watson. Recent. West Indies. West of Azores.

Pliciscala (Cylindriscala) albitesta (Meyer and Aldrich) Plate 8, fig. 17

Scalaria (*Opalia*) *albitesta* Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. vol. IX, No. 2, p. 41, pl. 11, fig. 7.

Whorls sessile, rather gradually diminishing in size, covered by lamellar transverse ribs, which are continuous along the whorls.

Newton.

Opalia sessilis Conr. from Claiborne has revolving lines.—[Meyer and Aldrich, 1886].

This species has eleven, thin, longitudinal ribs and lacks the fine, spiral lines which cover the surface of the whorls in *R. planulata, sessilis* and *harrisi.* The ribs are thinner than they appear in the illustration of *P. albitesia.*

P. albitesta appears to be of the type of shell as *Scalaria acus* Watson, a living West Indian and Atlantic species and of *S. lamberti* Deshayes[179] from the Eocene of the Paris Basin. The recent species De Boury made the type of *Torquatiscala* but which he later recognized as synonymous with *Cylindriscala.*

Dimensions.—Height, 11 mm.; greatest diameter, 5 mm., holotype.

176White, Ch. A., Cont. Pal. Brazil, Archives do Museo Nac., Rio de Janeiro, vol. VII, p. 193, pl. XIII, figs. 15, 16, 1887.

177de Boury, E., Etude sur les sous genres de Scalidæ du Bassin de Paris, p. 19, 1887.

178de Boury, E., 1909, p. 256; de Boury, E., ibid, vol. 60, p. 169, 1912; de Boury, E., ibid, vol. 63, p. 51, 1917.

179Deshayes, G. P., Ann. S. Vert., vol. II, p. 349, pl. 11, figs. 27, 28, 1861.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: locality 770.

Genus **ACIRSA** Mörch, 1857[180]

Genotype by subsequent designation De Boury, 1884[181], *A. borealis* (Beck) [non Gould]=*A. eschrichtii* (Holböll)[182]. Living. Greenland. Circumboreal.

Subgenus **HEMIACIRSA** de Boury, 1890[183]

Genotype by original designation *Turbo lanceolatus* Brocchi. Pliocene. Italy.

Acirsa (Hemiacirsa) gracilior (Meyer) Plate 10, fig. 5

Scalaria gracilior Meyer, 1886, Geol. Sur. Ala. Bull., vol. 1, pt. II, p. 67 pl. II, fig. 2; de Gregorio, 1890, p. 131, pl. 12, fig. 2.

Acirsa (*Acirsella*) *gracilior* (Meyer) Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 99.

Small, subulate, nucleus consisting of two rounded, spirally striated whorls. Five adult whorls are regularly rounded and covered with regular, sharp, transverse ribs which extend also over the base. Aperture elliptical.

Locality.—Claiborne, Ala.

I found only the figured specimen.—[Meyer, 1886].

This species has prominent, axial ribs which are not characteristic of *Acirsa* Mörch. or *Acirsella* de Boury, 1886[184].

This species and the following closely related *Hemiacirsa whitneyi*, n. sp. resembles species of that genus which are numerous in the Miocene and Pliocene of Italy.[185]

Dimensions.—Height, 1.75 mm.; greatest diameter, 75 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: Claiborne, Ala.

Acirsa (Hemiacirsa) whitneyi, new species Plate 10, figs. 6, 7

Shell small, slender; nucleus unknown, post-nuclear whorls probably seven, convex; whorls sculptured with six spiral threads with wide interspaces; eleven or twelve, longitudinal folds occur on the full length of the whorls; they do not extend the full

[180]Mörch, O. A. L., 1857, p. 5; Adams, H. and A., 1858, vol. II, p. 261.

[181]de Boury, E., Jour. de Conch., vol. XXXII, p. 160, 1884.

[182]Harmer, F. W., 1920, p. 558, pl. XLIX, figs. 6, 7.

[183]deBoury, E., Rev. d. Scal. mioc. et plioc. de l'Italia, Bull. Soc. Malac. Italiana, vol. 14, p. 112, 1890.

[184]de Boury, E., 1886, p. XXI type by original designation *A. inermis* (Desh.). Eocene. Paris Basin.

[185]Sacco, F. I., Molluschi dei terreni terziarii del Piemonts e della Liguria, pt. IX, pp. 88-92, pl. II, figs. 98-102; Cossmann, M., Essais Pal. Comp., 9 liv., p. 97-98, pl. VI, figs. 10, 21, 1912.

length of the body whorl; below the longitudinal folds on the body whorl, spiral lines close-set; one large, broad varix on the lower whorls.

This species resembles *A. gracilior* (Meyer) and is closely related to it. The heavy varix is not seen on *A. gracilior* and the spiral sculpture is not so conspicuous.

Named for Prof. F. L. Whitney, of the Geology Department, University of Texas, Austin, Texas.

Dimensions.—Height, 6 mm.; greatest diameter, 1.8 mm.; holotype.

Holotype.—No. 2752, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 741 (type) and 725.

Genus ACLIS Lovën, 1846[186]

Genotype by monotypy *Aclis supranitida* Lovën=*Aclis ascaris* Turton[187]. Living. Northern Europe.

"Aclis" modesta Meyer — Plate 8, fig. 8

Aclis modesta Meyer, 1886, Bull. Geol. Sur. Ala., No. 1, pt. II, p. 69, pl. 2, fig. 1; de Gregorio, 1890, p. 159, pl. 15, fig. 35; Cossmann, 1893, p. 25.

Minute; the sinistral nearly vertical; nucleus consists of two smooth whorls; adult whorls five; little convex; flattened immediately below the suture; covered with microscopical spiral lines; aperture regularly elliptical.

Locality.—Claiborne, Ala.

Only the type-specimen was found.—[Meyer, 1886].

The holotype of this species has not been found. The species suggests *Aclis* but is not typical. The species is not slightly umbilicate. The genus is umbilicated. The species is known only from the description and figure of Meyer.

There is a resemblance between this species and *Turbo nitidissimus* Montagu of the British Recent fauna which Hanley and Forbes[188] placed in *Aclis*.

Dimensions.—Height, 1 mm. (Meyer).

"Scalaria" quinquefasciata Lea

Scalaria quinquefasciata Lea, 1833, p. 116; de Gregorio, 1890, p. 130 [partim].

[186]Lovën, S. L., Index Molluscorum Scandinavia, p. 16, Cfv. K. Vet.—Akad. Forh., 1846 (1847).

[187]Forbes, E. and Hanley, S., 1851, vol. III, pp. 218, 219.

[188]Forbes, E. and Hanley, S., 1851, vol. III, p. 223, pl. XC, fig. 6, 7.

Two fragments of a species, for which I propose this name, are in my cabinet. These display sufficient characters to distinguish it. Five rather depressed bands are placed, transversely, on the middle of the whorls. Between the ribs are transvrse striæ. The ribs are sixteen in number and lamelliform. It is carinate below, with a small round mouth which is much thickened and reflected. The ribs have some resemblance to the *multistriata* (Say), a recent species of our southern coasts, but it certainly is not the same species.—[Lea, 1833].

This species was not figured by Lea. The specimen No. 5569, Academy of Natural Sciences which is doubtfully labelled type is probably not the true type. The drawing by Meyer of No. 5569 is herein included under *Cirsotrema nassula* (Conrad). The true *quinquefasciata* is probably related to *nassula* but its position is questionable.

Occurrence.—Gosport sand: Claiborne, Ala. (Lea).

"Scalaria (Cirsotrema) bella" Harris, 1895, p. 7 is a nomen nudum. Prof. Harris found it on a labelled specimen in the Academy of Natural Sciences at Philadelphia. It is the same as *Cirsotrema nassula* (Conrad).

Scala dormitor Conrad, 1865, is a nomen nudum. Conrad listed it as new in his check lists of 1865 and 1866 but did not figure or describe the species.

Family NATICIDÆ

Genus NATICA Scopoli, 1777[189]

Genotype by subsequent designation, Harris[190], *Nerita vitellus* Linnæus. Recent. Indo-Pacific.

Subgenus NATICARIUS Duméril,, 1805[191]

(Substitute name for *Natica* Lamarck, 1799,[192] non Scopoli, 1777).

Genotype by monotypy *Nerita canrena* Linnæus. Living. West Indies.

Section NATELLA, new section

Type *Natica magno-umbilicata* Lea. Claibornian Eocene. Alabama.

Shell subglobose, smooth except for radiating striæ just below the suture, most conspicuous on the body whorl; nucleus consists of one or one and a half, large, smooth whorls; umbilicus large

[189]Scopoli, J. Ant., 1777, p. 392.
[190]Harris, G., 1897, p. 255; Woodring, W. P., 1928, p. 377.
[191]Dumèril, A. M. C., 1805, p. 164.
[192]Lamarck, J. P., 1799, p. 77; Woodring, W. P., 1928, p. 378.

with a central funicle which may be tri-carinate, with the central ridge enlarged or it may be grooved; whole surface of the interior of the umbilicus coarsely striate; parietal callus small and not covering the posterior area of the umbilicus.

This group is like typical *Naticarius* in possessing the large, nuclear whorl, in the character of the coarse striations radiating from the suture and in the presence of a funicle. In *Naticarius* the funicle is large, occurs along the basal margin of the umbilicus, is not grooved or striated, and occupies over half of the width of the umbilicus (*N. canrena* (*L.*), plate 11, fig. 15.) The interior surface of the umbilicus is smooth. In *Natella* the funicle is situated in the mid-region of the umbilicus, is carinate or grooved and the remaining surface of the umbilicus is coarsely striate.

The character of the large nuclear whorl as seen in the type of *Natella* and in *N. canrena* and *N. vitellus* may be only a surface condition. An excess of callus may be spread over the whole of the nuclear whorls making the top appear enlarged. Sutural lines appear on worn tips of *N. vitellus.* The value of the character of nuclear whorls in this family has not been used or relied upon herein for separating groups. It is merely described as it appears. The nucleus of *N. gilberti* is elevated slightly and composed of two or two and a half, small whorls.

Natica (Naticarius) magno-umbilicata Lea

Plate 11, figs. 1-3; Plate 80, figs. 2, 3

Natica magno-umbilicata Lea, 1833, p. 109, pl. 4, fig. 95; H. C. Lea, 1848, p. 102; Conrad, 1866, p. 15; Dall, 1892, p. 366 [partim]; Harris; 1895, p. 27.

Natica magnoumbilicata (Lea) Conrad, 1865, p. 26; Cossmann, 1893, p. 25, pl. II, figs. 28-29; Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 112 section *Nacca.*

?*Natica bisulcata* Heilprin, 1879, Acad. Nat. Sci., Phila., Proc., vol. 31, p. 212, pl. 13, fig. 4; Meyer, 1887, Bericht Senckenb. Naturf. Ges., für 1886, p. 18.

Natica noae var. *magnoumbilicata* de Gregorio, 1890, p. 149, pl. 14, figs. 43-47.

non *Natica magno-umbilicata* Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 89, pl. 11, fig. 23.

Shell subglobose, smooth; substance of the shell thin; spire depressed, rounded; suture small; columella very slightly thickened, the callus being small and reflected above the middle of the umbilicus; umbilicus very wide, grooved; whorls three, inflated, with longitudinal folds on the superior part; mouth semi-lunate, nearly three fourths the length of the shell.

Length .2. Breadth nearly .2, of an inch.

Observations.—A single specimen only of this species has come under my examination. It most resembles the *minima* (above described), but has a larger umbilicus. It differs from all the species herein described, in having folds radiating below the sutures.—[Lea, 1833].

Lea defined his species clearly. Heilprin believed his shell was different from that of Lea because of a so-called double groove in the umbilicus. Both forms have the short radiating sulci from the suture with the striated umbilicus. The second groove in *N. bisulcata* Heilprin is an inner carination of the margin of the umbilicus. The umbilical rib in *magno-umbilicata* is large and varies in surface character, from rounded, tri-folded to grooved.

De Gregorio designated the species the same as the Paris Basin *noæ* d'Orbigny (*N. glaucinoides* Desh. [partim], 1825, p. 166, pl. 20, figs. 7, 8). *N. magno-umbilicata* has an entirely different umbilical region from *noæ*. This would seem to place them in different subgroups. *Magno-umbilicata* has an extremely wide umbilicus, with the surface covered with coarse, irregular, transverse lines. There is a well developed umbilical rib but it occupies a comparatively small portion of the umbilical surface. *N. semilunata* Lea is of the same group as *N. noæ*.

The nucleus consists of one or one and a half, large, smooth whorls which are slightly flattened on top and rounded on the sides.

The shells from the Sabine Eocene in Alabama which have been called *magno-umbilicata* by authors are not the species of Lea from the Claibornian. The Sabine form is renamed *gilberti*. It is further described in this report.

This species is not common and large shells have not been found.

Dimensions.—Height, 5 mm.; greatest diameter, 5 mm., lectotype.

Lectotype.—No. 5532, Academy of Natural Sciences, Philadelphia, Pa.; holotype of *Natica bisculata* Heilprin, No. 10134-1 (5551-1)[193] American Museum of Natural History, New York City.

Occurrence.—Gosport sand: locality 104.

"Natica" "(Naticarius)" semilunata Lea

Plate 11, figs. 10-13; Plate 80, figs. 1, 6, 11, 12

Natica semilunata Lea, 1833, p. 108, pl. 4, fig. 93; H. C. Lea, 1848, p.

193Whitfield, R. B., and Hovey, E. O., 1901, p. 456.

102; Dall, 1892, pp. 364, 365 [partim]; Harris, 1895, p. 41; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 86, pl. 11, figs. 18, 19.

Natica minor Lea, 1833, p. 107, pl. 4 fig. 90; H. C. Lea, 1848, p. 102; Conrad, 1865, p. 26; Conrad, 1866, p. 15; Dall, 1892, p. 364; de Gregorio, 1890, p. 150, [partim], pl. 14, fig. 51 non 50; Cossmann, 1893, p. 25 = *N. Gregoriori* Cossmann, 1892.

Natica minima Lea, 1833, p. 107, pl. 4, fig. 91; H. C. Lea, 1848, p. 102; Conrad, 1865, p. 26; Conrad, 1866, p. 15 [also under *Lunatia*]; de Gregorio 1890, p. 150, pl. 14, fig. 35 and var. *pusilliuscula* pl. 14, fig. 36 [young shell]; Dall, 1892, p. 370; Cossmann, 1893, p. 25.

Natica ætites Conrad, 1834, App. in Morton, p. 4 [partim]; nec Conrad, 1833, p. 46 nec authors. [See under *N. limula* Conrad].

Lunatia semilunata Conrad, 1865, p. 27; Conrad, 1866, p. 15; de Gregorio, 1890, p. 148, [partim], pl. 14, fig. 31; Cossmann, 1925, Essais Pal. Comp., 13 liv. p. 112 section *Nacca*.

? *Natica epiglottina* de Gregorio, 1890, p. 148, pl. 14, figs. 37-40=*N. gregorioi* Cossmann, 1892, Annuaire Geol. Univ., yr. 1890, T. VII, p. 1003=*N. minor* Cossmann, 1893, p. 25.

Natica (Lunatia) parva de Gregorio, 1890, p. 149, pl. 15, figs. 1, a, b,—2 non fig. 3 *parva Lea*.

Natica (Lunatia) mathoroni de Gregorio, 1890, p. 149, pl. 14, fig. 33= *N. gregorioi* Cossmann, 1892, ibid, [partim]=*N. minor* Cossmann, 1893, p. 25.

Shell subglobose, smooth; substance of the shell rather thin; spire slightly elevated; suture rather impressed; columella but slightly thickened, the callus being reflected at the middle of the umbilicus; umbilicus large and grooved; whorls five, inflated, slightly flattened below the suture; mouth semi-lunate, about two thirds the length of the shell.

Length, .4, breadth 7-20th of an inch.

The figure is somewhat larger than nature.

Observations.—This species resembles the *minor* above described, but differs from it in being more globose, the spire being much more depressed. The depression of the superior part of the whorl also distinguishes it.—[Lea, 1833].

More confusion and addition of names seem to be included under *N. semilunata* and its allies *minor* and *minima* than with any other of the Claibornian Naticidæ. This might happen because Lea's figures of *minor* and *minima* are not clear enough as to specific characters. The included Meyer drawings of the types show the characters of the shells more definitely and help to interpret Lea's description of the forms. The types of the three forms show an umbilical carina which would corroborate and interpret Lea's statements "columella thickened and reflected about the middle of the umbilicus." Such a character would place the three species in the same group of Naticidæ whether one believed they were shells of the same species or not. *N. minima* is the smallest of the three, 5 mm., in height, and represents a young shell. *N. minor* is 7 mm., in height. It has an enlargement of the penultimate whorl of the left side which throws the line of the spire off center. There is a specimen in the Harris collection which suggests a similar shape. The condition is probably abnormal. Prof. Harris believed *N. minor* Lea to be a pathologic specimen. This he noted at the time that he catalogued the Lea collection. *N. minima* Lea is a young specimen of *N. semilunata* Lea.

Conrad referred in his catalogues of 1865 and 1866 to *minima* under *Natica* and *Lunatia* and in each case gave the same reference. Harris, in his Claiborne list of 1895, p. 28, gave *minima* as the young of *N. mamma* Lea. *N. mamma* is a *Neverita* with different umbilical characters. Harris referred *minor* to *eminula*. The two are distinct in characters.

De Gregorio referred a series of specimens of *semilunata* to several names. He was handicapped by having only meager figures of Lea's species and not being able to examine the types. Cossmann had a clearer idea of what the species were but was excusably misled as to the character of *minor*. Dall regarded *N. minima* as a distinct species from *semilunata* and one which ranged through the Sabine to Jackson. He, however, did not have in mind a form like the type of Lea's *minima*, for he referred to a striate umbilicus rather than a carinated one. The *minima* of Dall is apparently the variety of *semilunata* which is here designated as *leana*, new and which is common in the Sabine stage as well as the Jackson. The umbilicus in that form lacks a funicle. The umbilicus may be finely or coarsely striated.

This species begins in the Sabine (Wilcox) Eocene and exhibits in that stage of the Eocene a greater variation in the shell than in the Gosport sand. The form which has an elevated spire was named from the specimens in the Gosport sand. The whorls have rounded shoulders and as Lea described are "slightly flattened below the suture." The body whorl is globose. The umbilical funicle is variable. It is stronger in the young specimens. In some adult specimens the funicle is enlarged showing typical *Naticarius* characters. *Natica canrena* L. is herein figured for comparison.

In the Gosport sand, the characters mentioned are constant in the species from the young stages to the adult with the exception that some individuals may be slightly more elevated and the anterior portion of the shell more attenuated. In the older Claibornian of Texas, specimens exhibit a strong and constant funicle. Specimens from Smithville, Texas, with the strong funicle, Prof. Harris in his Texas Eocene MS. gave the varietal name *janthinops*. This name was not published although it has appeared in lists. There are slight differences between the Smithville form and the typical *N. semilunata* of the Gosport sand. The difference is mostly in the strength of the umbilical carina.

In the Sabine (Wilcox) the species was not stable in character. It varied along two definite lines, one of which survived with a few stragglers in the Claiborne. The species occurs typically in the Sabine. One variation of the species was toward an extremely high spire with the area so impressed below the suture that when the surface is decorticated a groove is left. The umbilical funicle is present but obscure. This variation grades into the typical. It did not persist apparently later than the Sabine. This variation is called *sabina*, n. var. The other direction in which the species varied resulted in a form in which the umbilical funicle is totally absent and the spire slightly lower than typical with the whorls rounded. This variation is called *leana*, n. var. Prof. Harris pointed out the changes in the Sabine forms in his monograph of that fauna. There are three specimens of *leana* in the Gosport sand collection. It is common in the Jackson Eocene.

N. semilunata has not a typical Natica umbilical callus. Even though the species produced variations in which the umbilical rib became obscure, umbilicus and callus are more typical of *Naticarius* than *Natica s. s.* *N. semilunata* lacks the sutural sulci of *Naticarius*. The variations of *N. semilunata* became like *Euspira* in appearance. The fact that variations of a species which have a strong umbilicated rib tend to become like *Euspira* in shape may indicate that the *Euspira* type of shell is not constant for a group. Further discussion is given under *Euspira*. Difficulty occurs in trying to classify generically such variations of *N. semilunata* as *sabina* and *leana*. They are not typical *Natica* or *Naticarius* except by origin. It does not seem consistent to place them under *Euspira* when they are intimately related to a species which does not have *Euspira* characters.

Dimensions.—Height, 10 mm.; greatest diameter, 10 mm., holotype.

Lectotypes.—No. 5529, Academy of Natural Sciences, Philadelphia, Pa., *N. semilunata* Lea; No. 5524, A. N. S., *N. minor* Lea; Nos. 5526-27 A. N. S., *N. minimi* Lea.

Occurrence.—Sabine: Woods Bluff, Gregg's Landing, Ala. Lower Claiborne: localities 707, 708, 723, 726, 728, 731, 733, 741, 743, 767 and 803. Gosport sand: locality 104 (type).

"Natica" semilunata sabina, new variety Plate 11, figs. 8, 9

Natica semilunata Harris, 1899, Bull. Amer. Pal., vol III, No. 11, p. 87 [partim].

Spire elevated, apex rather sharp and pointed; whorls of the spire angulated; whorls six with a minute nucleus; area below the suture impressed; callus thin; umbilical carina present but may be obscure and often entirely lacking.

This variety grades into typical *semilunata* but the extreme members differ in lacking the umbilical rib. This variety has a more elevated spire than *N. leana* and lacks the striations within the umbilicus.

Dimensions.—Height, 18 mm.; greatest diameter, 14 mm.

Syntypes.—Nos. 2769, 2770, Paleontological Research Institution.

Occurrence.—Sabine: localities 749, 753, (type), 864 and 865.

"Natica" semilunata leana, new variety Plate 11, figs. 1-7

Natica semilunata Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 87, pl. 11, fig. 20.

cf. *Lunatia minima* Dall, 1892, p. 370.

Shell globose, spire lower than *semilunata* s. s.; whorls rounded; slight intimation of an impression below the suture; parietal callus wanting or meager; umbilical callus slight, margin sharp; umbilical rib not present; umbilicus commonly spirally striated, often the striations are coarse; young commonly and some adults have an umbilical callus notch as in *Euspira* s. s.

This variety does not show as close a gradation to the typical form of *semilunata* as does *sabina*. It shows a longer development for a few specimens have been found in the Claibornian and it occurs again in fairly large numbers in the Jacksonian Eocene. This shows that this variation was the most constant of the three types developed in the Sabine Eocene. It may not be proven which is the original stock. There could be the possibility that *semilunata* and the var. *sabina* developed from the *leana* stock.

Comparing *leana* with the type of *Euspira* one finds that it is a typical *Euspira* according to the superficial shell characters including the not uncommon occurrence of the umbilical callus notch. The umbilical rib in typical *N. semilunata* Lea bars the species from *Euspira*. Complications can, therefore, be seen in using such a genus as *Euspira*.

N. semilunata leana and *N. gilberti* might be confused because of the presence in each of spiral striations on the umbilical surface. The umbilicus in *N. gilberti* is larger, the body whorl does not overhang the umbilicus as much as in *N. leana*, hence a greater altitude is given to the umbilical opening in *gilberti*. The margin of the umbilicus in *gilberti* does not form a callus at the posterior end as in *leana* and there is a slight notch between the margin of the umbilicus and the parietal callus in *gilberti*. Such an enlarged umbilical outline is constant and in the Claibornian derivative led Lea to name such development *magno-umbilicata*.

Dimensions.—Height, 16 mm.; greatest diameter, 14.5 mm.

Holotype.—No. 2768, Paleontological Research Institution.

Occurrence.—Sabine: Woods Bluff, Ala. Gosport sand: locality 104. (type); Jackson: Montgomery, La. Upper bed.

"Natica" gilberti, new species Plate 11, figs. 14, 16, 17

Natica magno-umbilicata Aldrich, 1886, Bull. Geol. Sur. Ala., No. 1, p. 51; Dall, 1892, p. 366 [partim]; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 89, pl. 11, fig. 23.

Shell medium in size and thin; spire elevated; suture distinct and sunken with the margin of the whorls rolled away from the suture; aperture semilunate; umbilicus large, the interior with irregular in size, transverse lines, coarser in the middle; some specimens have two or three mid-lines enlarged which form a double groove; large umbilical rib lacking; nature of the interior of the umbilicus identical with that of *N. magno-umbilicata* except for the presence of the large rib in *magno-umbilicata;* callus thin with a sharp margin and an indentation of the margin just below where it separates from the body whorl.

The character which obviously separates this species from *N. magno-umbilicata* with which it has always been classed, is the absence of the umbilical rib. In shape, it is entirely different from the Claiborne species. It lacks the longitudinal sulci below the suture. It has a much more elevated spire and it has the sunken suture with the convex margin of the whorls. The left, anterior margin of the aperture in *gilberti* is in line with the line of the spire while in *magno-umbilicata* it is to the right making the aperture obliquely set to the spire. In shape *N. bisulcata* Heilprin (=*N. magno-umbilicata* Lea) from the Claiborne Eocene is of the same order.

Named in honor of Prof. Gilbert D. Harris who anticipated that the species would some time be differentiated from *N. magno-umbilicata* Lea.

Natica gilberti is not a typical *Natica* or *Naticarius* or *Natella* in that there is no suggestion of a low funicle in the umbilicus. Unlike *Natica* s. s. the umbilical surface is coarsely striated within. In that respect it is like *N. magno-umbilicata* Lea which also has characters like *N. canrena* (Linn.) the type of the subgroup *Naticarius* Dumeril. The umbilical rib in *magno-umbilicata* is not so large, comparative size, as in *Naticarius* and the position of the funicle differs in the two species. *N. gilberti* appears like the incipient stage in umbilical development of *magno-umbilicata* but lacks a suggestion of sutural sulci which occur on *magno-umbilicata* and which characterize *Naticarius*. It is probably the group which later in the Clairbornian developed the combination of characters which has been designated herein as *Natella*. The character of the striated umbilical surface without an umbilical rib occurs in the variation of *Natica semilunata leana*.

In the Naticidæ the funicle is variable in size, hence species with a close relationship as *N. magno-umbilicata* and *N. gilberti*, one hesitates to separate generically.

Dimensions.—Height, 12 mm.; greatest diameter, 11 mm.

Syntypes.—Nos. 2775, 2776 and 2777 Paleontological Research Institution.

Occurrence.—Sabine Eocene: Woods Bluff, Ala. (type).

Genus **POLINICES** Montfort, 1810[195]

(*Uber* Humphreys, 1897)[196]

Genotype by original designation *Polinices albus* Montfort= *P. mammilaris* (Lam.). Living. West Indies.

[195]Montfort, D. de, 1810, p. 223.

[196]Int. Rules Zool. Nom., Opinion 51, Proc. Biol. Soc. Wash., vol. 39, p. 97, 1926; Hedley, C., Rec. Austr. Mus., vol. 14, No. 3, p. 154, 1924; Findley, J. J., Trans. N. Z. Inst., vol. 57, p. 395, 1926 *Uber*.

Section MAMMILLA Schumacher, 1817[197]

Genotype by monotypy *Mammilla fasciata* Schumacher=*Natica melanostoma* Lamarck. Living. Indian Ocean.

Polinices eminula (Conrad) Plate 12, figs. 2, 4, 9, 13; Plate 80, fig. 14

Natica eminula Conrad, 1833, Nov., p. 46; H. C. Lea., 1848, p. 102; d'Orbigny, 1850, p. 346; Harris, 1895, p. 18.
Lunatia eminula Conrad, 1865, p. 26; Conrad, 1866, p. 15.
Natica parva Lea, 1833, p. 106, pl. 4, fig. 89; H. C. Lea, 1848, p. 102; de Gregorio, 1890, p. 149, pl. 15, fig. 3 not 1 a b, 2 [*Lunatia*]; Dall, 1892, p. 371; Cossmann, 1893, p. 26.
Natica (*Lunatia*) *parva* (Lea) Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 139, section *Labellinaca*.
Natica eminula (Conrad) var. Harris, 1896, Bull. Amer. Pal., vol. 1, No. 4, p. 233, pl. 12, fig. 20 non *Polinices harrisi* Gardner, 1935, Univ. Texas Bull. No. 3101, p. 307, pl. 26, fig. 15.

Obovate, with smooth convex volutions and a prominent conical spire; umbilicus elliptical, not contracted by the callus; aperture obovate, rather more than half the length of the shell.—[Conrad, 1833].

This species is distinct from the other Naticoid species in the Claibornian by its elongate shape with appressed suture and no shoulder to the whorls. The sides of the whorls of the spire make almost a continuous straight line. There is an absence of an umbilical rib and a notch on the umbilical callus. The umbilicus and callus are well developed but not large. The callus is thin and has a sharp margin. There is a small, sharp fold or ridge in the callus across the posterior margin of the aperture.

E. eminula differs from *N. semilunata* Lea, in lacking the angulated whorls and the umbilical rib. It is a slenderer species.

The Conrad type collection consists of five specimens. The largest is selected as the lectotype.

This species is a typical *Polinices* in shape and form of the parietal callus. Such a callus is thickened, filling the posterior portion of the aperture, the anterior margin of the callus abrupt, joining the outer lip at a right angle to the shell axis. The species does not have the large funicle of *Polinices*. In this respect it belongs to the section *Mammilla*.

Gardner included the *Natica eminula* Harris of the Midway of Alabama under *Polinices harrisi* Gardner. But as figured by Harris *N. eminula* in the Midway Bull. (vol. 1, No. 4, 1896) is a *Polinices* related to *eminula* while the *N. eminula* var. Harris in the Sabine Bull. (vol. 3, No. 11, 1899) is an *Euspira* of the *marylandica* stock.

[197]Schumacher, C. F., 1817, p. 190.

Dimensions.—Height, 20 mm.; greatest diameter, 15 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5518, A. N. S., lectotype *N. parva* Lea.

Occurrence.—Midway Eocene; Ala. Gosport sand: locality 104 (type).

Polinices weisbordi, new species Plate 12, figs. 7, 10

Shell subglobose, elevated, body whorl has a greater height than diameter; nucleus composed of two to three whorls, first whorl minute, flattened; sides of the whorls of the spire straight or slightly convex; umbilicus small; the parietal callus extends thickened across the posterior area of the aperture with the margin of the callus ridge-like; across the upper portion of the umbilical callus are two slash-like grooves.

This species is like the type of *Mammilla.* Typical *Polinices* has a larger umbilical opening with a large funicle.

The form occurs abundantly in the Jackson Eocene. In collections it is usually labelled *Natica eminula* Conrad, the Clairbornian species. The general shape of the body of *P. weisbordi* is much like *eminula* and it is this character which confuses the two species. The Jackson shells, including a series from young to adult, have a conspicuously shorter spire with the nuclear whorls flattened. The apical whorls of *eminula* extend to a peak. The parietal callus of the Jackson species is heavier and the umbilical callus extends further over the umbilicus. On the umbilical callus of *P. weisbordi,* two conspicuous, transverse grooves occur which are not present on *E. eminula.* Such grooves or a groove occur on the type of *Polinices.* Such grooves are prominently present on *P. arata* (Gabb) from the lower Claibornian.

Named in honor of Norman E. Weisbord, of the N. V. Nederlandsche Nieuw Guinee Petroleum Maatschappij, Babo, New Guinea.

Holotype.—No. 2785; paratype, No. 2784; Paleontological Research Institution.

Dimensions.—Height, 20 mm.; greatest diameter, 15 mm.

Occurrence.—Jackson: (type), Montgomery, La.

? "Polinices" harrisi Gardner

Polinices harrisi Gardner, 1935, Univ. Texas, Bull. No. 3301, p. 306, pl. 26, fig. 15.

Dr. Gardner described this species from the Midway of Texas and included the *Natica eminula* (Con.) Harris from the Midway of Alabama (see under *Polinices eminula*) and from the Sabine of Alabama (see under *Euspira marylandica*) under *Polinices harrisi.* The angulated whorls and the umbilicus suggests that *P. harrisi* is an *Euspira* and not a *Polinices.* The Sabine form which is here included under the *Euspira marylandica* (Con.) variety may be the same as *"Polinices" harrisi* Gardner but the Midway *eminula* of Harris is *Polinices eminula* (Conrad) or variety.

Section **PLICONACCA** Cossmann and Martin, 1914.[198]

Type by monotypy *Natica trisulcata* Martin. Eocene. Java.

Polinices arata (Gabb) Plate 13, figs. 5, 10, 12, 15, 17, 18; Plate 80, fig. 15

Nererita arata Gabb, 1860, Acad. Nat. Sci. Phila., Jour., 2d. ser., vol. IV, p. 384, pl. 67, fig. 35; Conrad, 1865, p. 27; Conrad, 1866, p. 15; Heilprin, 1891, p. 399, [under *Natica*].
Neverita gibbosa Dall, 1892, p. 368 [partim].
Natica (*Polynices*) *arata* (Gabb) Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 131, pl. IV, figs. 8-9 section *Pliconacca.*

Subglobose, oblique, approaching *Sigaretus* in the angle of the body whorl; whorls five, very much enveloped, spire low, suture indistinct; mouth ovate, outer lip very thin, inner lip thick, with a slight emargination between the inner and outer lip at the posterior angle; umbilicus large, nearly filled by the callosity on which exists sometimes two, sometimes three deep, transverse grooves, surface smooth, polished.
Common from both localities. [Wheelock and Caldwell counties, Texas].
Dimensions.—Height .18 in., greatest diameter of mouth .25 in., width of body whorl .31 in.—[Gabb, 1860].

Dall regarded *P. arata* as the young of *Neverita gibbosa.* The two species are distinct. *Arata* is a *Polinices* while *gibbosa* is a typical *Neverita* of the section *Glossaulax* Pilsbry. The callus of the two species is of a different type which may be easily seen by the illustration. *P. arata* retains three, transverse, slash-like

[198]Cossmann, M. and Martin, K., Die Fauna des Obereocäns von Nanggulan auf Java, Leiden Samml. Geol. Reichsmus, 2, p. 171, pl. VI, fig. 149, 1914.

grooves across the callus throughout its shell history. The adult *arata* is of the same size as a medium sized *gibbosa*. *P. arata* is elongated in shape as *P. albus* Montfort=*mammillaris* (Lam.) the type of *Polinices* while *gibbosa* has the body whorl more globose. The transverse groove in *gibbosa* suggests a union of the upper and lower lobes of the umbilical callus. In *P. arata* the callus has a different nature. It is elongated without a superior wider, lobe. The three grooves which cross the callus are similar to grooves made by pressing a pencil point in soft putty. The groove which occurs on the type of *Polinices* is of a similar nature. The three grooves have been found in an Eocene species of Java, *N. trisulcata* Martin, type of the section *Pliconacca* Cossmann and Martin. These two unique species are as yet the only two known species of the section.

The species is exceedingly abundant in all stages of development at Moseley's Ferry, Brazos River and 2½ miles above Stone City, Little Brazos River, Texas. The young 1 mm. in size have the grooves and ridges across the callus well developed. The species may be quickly identified at any stage of the growth by those marks.

I have found one specimen of *P. arata* in the Gosport sand. This might be due to a mixture but the shell has within it a bit of typical "sand" and the shell appearance is that of Gosport sand specimens.

Dimensions.—Height, 8 mm., greatest diameter, 8 mm., lectotype.

Lectotype.—No. 13295, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne; localities 103, 723, 724, 725, 726, 727, 729, 730, 731, 733, 734, 741, 743, 747, 748, 756, 765, 766, 767, 773 and 803.

Genus NEVERITA Risso, 1826[199]

Genotype by monotypy *N. josephinia* Risso. Recent. Southern Europe.

[199]Risso, A., 1826, pp. 149-150, pl. 4, fig. 43.

Section **GLOSSAULAX** Pilsbry, 1929[200]

Type by original designation *Neverita reclusiana* (Deshayes). Living. N. California to Mexico.

Neverita limula (Conrad)

Plate 13, figs. 13, 14, 16, 19-22; Plate, 80, figs, 13, 16

Natica limula Conrad, 1833, Nov., p. 46; Conrad, 1834, App. in Morton, p. 4; H. C. Lea, 1848, p. 102; d'Orbigny, 1850, p. 346; Conrad, 1857, U. S. and Mex. Bdy. Repts. Pal., p. 162, pl. 19, fig. 7 [given as *eminula* on plate]; Heilprin, 1891, p. 399; Harris, 1895, p. 24; Harris, 1896, Bull. Amer. Pal., vol. 1, No. 4, p. 232, pl. 12, fig. 16.
Neverita limula Conrad, 1865, p. 27; Conrad, 1866, p. 15; de Gregorio, 1890, p. 153.
Natica ætites Conrad, 1833, ibid, p. 46; Conrad, 1834, App. in Morton, p. 4 [partim]; H. C. Lea, 1848, p. 102; d'Orbigny, 1850, p. 345; cf. Conrad, 1856, Pac. R. R. Rept. vol. 5, p. 321, pl. II, fig. 7 [*eminula* on plate, shell partially figured].
Neverita ætites Conrad, 1865, p. 27; Conrad, 1866, p. 15.
Natica gibbosa Lea, 1833, Dec., p. 108, pl. 4, fig. 92; H. C. Lea, 1848, p. 102; de Gregorio, 1890, p. 152, pl. 14, fig. 34.
Neverita gibbosa (Lea) Conrad, 1865, p. 27; Conrad, 1866, p. 15; Dall, 1892, p. 367; Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 117.
Natica mamma Lea, 1833, p. 109, pl. 4, fig. 95; H. C. Lea, 1848, p. 102; Cossmann, 1893, p. 26.
Neverita mamma (Lea) de Gregorio, 1890, p. 152, pl. 14, figs. 18-24; Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 117.

Obliquely suboval, smooth, with a short convex spire; umbilicus nearly closed by a profound callus; aperture elliptical.—[Conrad, 1833; *limula*].
Subglobose, spire very short, umbilicus large, contracted by the callus, and with a prominent, obtuse, broad carina revolving within it; aperture semilunar.—[Conrad, 1833; *ætites*.]

This species is an abundant form in the Gosport sand and presents a series of variation. The extreme members have had irregularly, the four names respectively of Conrad and Lea applied to them. With abundant material of the species it does not seem that the changes manifested by the form are discontinuous enough to warrant the use of more than one name.

Conrad's names of *ætites* and *limula* were used with a description first, and they were never figured by him. The two names were proposed on the same page of the same publication, *ætites* being first. Harris was the first to suggest that the four names (see synonymy), might represent one species with varieties. This he did on p. 24 of his checklist of 1895. He used *limula* for the species name and since it has been in common usage for the group I choose the name to stand for the species. Fortunately *limula* represents the typical phase of the species judging by the

[200]Pilsbry, H. A., Nautilus, vol. XLII, No. 4, p. 113, 1929.

greater abundance of the shells. *Aetites* Conrad is the variation which has the anterior portion of the aperture more attenuated or it appears so from the wide swing and open anterior portion of the umbilicus. The clue to the difference in the two forms is in the descriptions of the umbilicus by Conrad. Under *limula* he said, "umbilicus nearly closed by a profound callus" and under *ætites,* the umbilicus is "large, contracted by the callus, and with a prominent, obtuse, broad carina revolving within it". Those descriptions seem explicit and are exactly what one finds on the shells. The reason the broad carina shows in *ætites* is because the callus lobes do not extend over and hide it as in *limula.* In shape there is variation in gibbosity of the body whorl and a slight change in the elevation of the spire. It has been upon these characters that most of the separation of this species has been made in the past.

The unreliability of using the shape of the shell can be seen in the figures and descriptions of the original four species of Lea and Conrad and an examination of the type material. The *gibbosa* of Lea is *limula* of Conrad which in spite of its gibbosity is higher than *limula.* The *mamma* of Lea is the *ætites* of Conrad in character of the umbilicus but *mamma* is the low form with large body whorl while *ætites* is nearly as high as *limula* but broader. Such a mixture of features hardly indicates a constancy in the shape of the shells. Amongst Conrad's original specimens on his *limula* card are high and low specimens. No. 12797 had been marked as lectotype.

The Conrad type collection of *N. limula* consists of 6 specimens. The largest specimen had formerly been selected as lectotype. The specimen selected does not show the groove on the callus as conspicuously as in the others.

One of the four Conrad type specimens of *N. ætites* had formerly been chosen as lectotype. The lectotype has a narrower callus than typical showing the carina. The groove is higher than typical. The other 3 specimens are typical *limula.*

The types of *N. gibbosa* Lea and *N. mamma* Lea are typical *N. limula* Con.

The lectotypes of *N. ætites* and *N. limula* represent extreme forms of the species *limula*. Specimens may be found intermediate in character.

Typical *limula* extends the callus well over the umbilicus in varying degrees of completeness. Specimens have not been found in which the area is as completely covered as in *N. duplicata* Say of the Chesapeake Miocene through to Recent, where the line of the callus and the surface of the body whorl below are on the same level. Dr. Dall regarded *N. duplicata* as the descendant of *limula*. There is always a deep groove left along the lower margin of the callus in *limula*. The amount of callus in *limula sensu lato* varies from completeness to the extreme in *ætites* in which the umbilicus is wide and deep, with a heavy callus above and extending to and swelling the upper surface of a wide, revolving carina on the interior. The same variation in the callus occurs in young specimens. There is a transverse groove on the callus in the young and several occur on some specimens. The transverse groove on the adult is variable in strength. Some have it pronounced while it is absent on others. But in several hundred specimens examined, where the groove occurred, well developed to a faint line, there was less than a score of specimens with no trace of the groove. The variation in the groove is not limited to either the *limula* or *ætites* phase.

Dr. Dall believed that the *arata* of Gabb from the lower Claiborne of Texas was the young of *limula*. A discussion of the differences of the two species is given under *arata*.

N. secta (Gabb)[201] from the Tejon Eocene of California is regarded as the West Coast analogue. Judging from Stewart's figure of the type, the callus extends to a greater extent over the lower part of the umbilical area.

Dr. Pilsbry has segregated the Neveritas which have a grooved umbilical callus, under the name *Glossaulax*, typified by the well known West Coast *N. reclusiana*. It is extremely interesting to find Claibornian representatives of a group which today is widely distributed in the Pacific.

[201]Gabb, Wm., Pal. Cal., vol. 1, pp. 108-109, 225, pl. 29, fig. 220, a, 1864; Stewart, Ralph, 1926, p. 325 pl. XXX, fig. 17.

Dimensions.—Height, 25 mm.; greatest diameter, 23 mm., lectotype *N. limula* Con. Height, 28 mm., greatest diameter, 25 mm., lectotype *N. gibbosa* Lea. Height, 23 mm., greatest diameter, 26 mm., lectotype *N.* ætites Con. Height, 18 mm., greatest diameter, 14 mm., lectotype *N. mamma* Lea.

Types.—No. 12797, lectotype *N. limula* Conrad; No. 5528, lectotype *N. gibbosa* Lea; No. 12796, lectotype *N. ætites* Con.; No. 5538, lectotype *N. mamma* Lea, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Midway Eocene (Harris). Lower Claiborne: localities 103, 708, 726, 728, 730, 731, 733, 734, 747, 766, 768 and 773. Gosport sand: locality 104 (type).

Genus **EUSPIRA** Agassiz, 1839[202]

Genotype by subsequent designation, Dall, 1915,[203] *Natica glaucinoides* Sowerby. Eocene. England.

The nomenclatorial status of *Euspira* Agassiz, 1839, was introduced by Dall in 1908 and 1909 and has since been verified as to dates and type by Stewart. The biological relationships have however been neglected and we are far from a knowledge as to where the forms belong. A misleading line of deduction as to the character of *Euspira* is that of following Dall in attributing the characters of *Lunatia* to those of *Euspira* without actually finding them on the type of *Euspira.* From a similarity of shell appearance Dall placed *Lunatia* Gray, 1847, as synonymous with *Euspira.* The exact type of *Lunatia* is still a question but whichever of the two species, *N. ampullaria* Lamarck[204] (=*N. heros* Say or *N. catena* Da Costa) the type may be decided upon, *Lunatia* is recent with a horny operculum. The operculum of *E. glaucinoides* (Sowerby), type of *Euspira* is not known.

Authors[205] because *Lunatia* has been placed as synonymous with *Euspira* ascribe a horny operculum to *Euspira* and place *Lunatia lewisii* Gould, a western American species, under *Euspira.* The callus of *lewisii* is hardly typical of *Euspira.*

[202]Agassiz, L., in Desor, French translation of Sowerby's Min. Conch. Gt. Brit., pp. 14, 15, 16, 1839; Stewart, R. B., Acad. Nat. Sci. Phila., Proc. vol. 78, p. 324, 1926; Stewart, R. B., ibid, Special Pub. No. 3, p. 42. 1930.
[203]Dall, W. H., 1915, p. 106.
[204]Dautzenberg, Ph. and Fischer, H., 1912, p. 229 full synonymy given.
[205]Marwick, J., Trans. and Proc. New Zealand Inst., vol. 55, p. 568, 1924; Grant, U. S. IV and Gale, H. R., 1931, p. 803.

Perhaps a separation of *Lunatia* and *Euspira* would help to clarify such points as have been raised by authors.

"In widely umbilicated specimens [*Natica maori* Findley] sometimes but not always there is a slight furrow to mark its lower extremity. Such shells as the Petane ones, if considered on their merits, would be classed as *Euspira*, but they are certainly closely related to if not specifically identical with *N. maori*, which has a shelly operculum."[206]

"Most of the recent species which are called *Euspira* live in Arctic and north temperate waters, a very remarkable distribution for an Eocene gastropod."[207]

One cannot say that *Euspira* does not have a horny operculum but the fact must be settled from genotypic material.

Euspira newtonensis (Meyer and Aldrich) Plate 12, figs. 1, 3, 6, 11

Natica newtonensis Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. vol. IX, No. 2, p. 42, pl. II, fig. 12.
Natica (*Lunatia*) *semilunata* de Gregorio, 1890, p. 148, [partim], pl. 14, fig. 32.
Lunatia newtonensis (Meyer and Aldrich) Dall, 1893, p. 370.
Ampullina newtonensis (Meyer and Aldrich) Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 28.
? *Lunatia newtoniensis* (Meyer) Cossmann, 1925, ibid, p. 135 [erroneous reference in Cossmann].

Shell thick. Depressed globular. Spire low. Suture distinct. Whorls six, convex; body whorl flattened above. Umbilicus deep. Inner lip somewhat spreading over the body whorl.

Newton, Wautubbee, Lisbon, Ala.

The type specimen is from Newton. The form is characterized by its robust, subquadrate shape.—[Meyer and Aldrich, 1886].

Dimensions.—Height, 14 mm.; greatest diameter, 15 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 728, 729, 731, 734, 748 and 803.

Euspira aldrichi, new species Plate 12, figs. 5, 8, 12, 15

Shell medium in size, the line of the sides of the whorls of the spire straight and continuous; spire short; umbilicus well developed, no umbilical rib; parietal callus complete and well de-

[206]Marwick, J., 1924, ibid, p. 552 defines *Euspira* with horny operculum.
[207]Stewart, R. B., 1926, p. 324.

veloped; a notch occurs on the margin of the upper portion of the umbilical callus as in *Euspira;* in the young an irregular node occurs on the callus where the notch develops in the adult. The node occurs on the young of Orangeburg, S. C. specimens as well as on the specimens from the type locality at Lisbon, Ala.

The young specimens of *aldrichi* and *eminula* from the Gosport sand are only distinguished from each other by the node or knob on the young of *aldrichi.* However the adult and specimens of intermediate age are distinct in shape. The two species are alike in having the sides of the spire straight but the spire of *eminula* is one and a half or two times the height of the spire of *aldrichi.* The body whorl in *aldrichi* is much broader than in *eminula. E. eminula* lacks the umbilical callus notch which occurs on *aldrichi.*

The species is named in honor of the late Truman H. Aldrich, who collected in and studied the southern Eocene for half a century.

Holotype.—No. 2787 Paleontological Research Institution.

Dimensions.—Height, 17 mm.; greatest diameter, 15 mm.

Occurrence.—Lower Claiborne: localities 708, 731, 734 and 733.

Euspira marylandica (Conrad) Plate 12, figs. 14, 16-18

Lunatia marylandica Conrad, 1865, pp. 26, 211, pl. 21, fig. 11; Conrad, 1866, p. 15; de Gregorio, 1890, p. 150, pl. 14, fig. 49; Dall, 1892, p. 371; Clark, 1896, U. S. Geol. Sur., Bull. No. 141, p. 69, pl, XII, figs. 3a-c; Clark and Martin, 1901, Md. Geol. Sur., Eocene, p. 151, pl. 28, figs. 2, 2a, 3.

cf. *Lunatia eminula* var. Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 88, pl. 11, fig. 22.

Suborbicular or subovate, volutions 5; spire short, whorls convex, subcontracted below the suture; labium with a callus on the upper part, reflexed over the umbilical margin; umbilicus moderate in outline, profound, showing most of the volutions.—[Conrad, 1865].

There are seven specimens in the Conradian collection of *Natica marylandica* Conrad at the Academy of Natural Sciences from Upper Marlboro, Md. The specimens are like the specimen figured in this report from Bell's Landing, Ala. except on the Marlboro shells the notch is not so conspicuous. The callus on the type material, along the posterior line of the umbilicus has a right angle margin to the aperture.

Conrad described *Lunatia marylandica* but did not give the locality. One would suppose that he meant the form to have come from Maryland, and specimens from Maryland and Virginia appear much like Conrad's figure.

The small notch or right angle margin of the umbilical callus occurs on a large collection of specimens of the species from the Chesapeake Eocene embayment. A similar notch occurs on the specimens of the species in the Sabine Eocene of Alabama. The notch is prominent on the Vicksburg representative of the same stock.

The notch is commonly present on *E. glaucinoides,* the genotype, and well developed in most specimens but there are some which lack it. It may therefore be present in the genus but not constant.

There is apparently a stock of *Euspira* which extends through the Eocene and Vicksburg Oligocene and occurs, within a certain variation of form, in the different geologic stages. The oldest name was *vicksburgensis* in 1848 which Conrad forgot in his check lists of 1865 and 1866. There is a figure of the type by Meyer in the Aldrich collection of drawings. It shows slightly angulated whorls of the spire, a moderate callus notch absent and a well-opened umbilicus present. It will not be known until the Vicksburg fauna is thoroughly worked, whether the common shells with notched, umbilical callus in the Vicksburg named *N. decipiens* by Meyer[208] are the same as the *vicksburgensis* of Conrad as Dall believed in 1892.

In shape the figures of the types of each are much alike. Specimens in the Harris collection from Vicksburg, like *decipiens,* in all other respects, have a more convex and rounded body whorl which is broader in proportion to the length than the type figures of the two described species. This stock occurs in the Eocene of Alabama. The form was described by Prof. Harris as a variety of *eminula* with the relationship pointed out. The affinity of *eminula* of the Claibornian with either the *marylanica* of the Chesapeake Basin or the Sabine (Wilcox) variety of the Alabama is not confirmed. The author favors the other interpretation

[208]Meyer, O., Bull. Geol., Sur. Ala., No. 1, pt. II, p. 69, pl. II, fig. 22, 1886 non *Natica decipiens* d'Arch., 1853.

which Prof. Harris pointed out that the Sabine (Wilcox) form is the same or a variety of *marylandica.*

Dr. Julia Gardner[209] described *Polinices harrisi* from the Midway of Texas under which she included the *Natica eminula* var. Harris[210] from the Midway and Sabine of Alabama. See further discussion under *Polinices eminula* (Con.) and *"Polinices" harrisi.*

E. eminula Conrad is a slender shell with sides of the whorls of the spire in a straight line from the apex to the body whorl. The sides of the whorls of the spire of "*eminula* var." Harris of the Sabine have slightly rounded whorls and the shell is not as slender as *"E." eminula.* The whorl sides have a tendency to become straight but when they approach the degree of *eminula* the spire is shorter and the body whorl is broader. There is no trace of an umbilical notch on *eminula.*

Dimensions.—Height, 18 mm.; greatest diameter, 13 mm.

Occurrence.—Sabine and lower Claiborne: Aquia and Nanjemoy formations of Maryland. See Clark and Martin for localities. Lower Claiborne: localities 708 and 734.

"Lunatia" moorei Gabb Plate 13, fig. 11

Lunatia moorei Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser. Jour. vol. IV, p. 384, pl. 67, fig. 34; Heilprin, 1891, p. 399; Dall, 1892, p. 371,
? *Natica Moorei* (Gabb) Heilprin, 1891, p. 399.

Thin, subglobose; whorls three, flattened above, spire low; mouth ovate, outer lip plain, arcuate, inner lip and columella very thin; umbilicus closed, callus very small almost rudimentary; surface smooth.

Dimensions.—Height .15 in., length of mouth .12 in., width of body whorl .13 in.

Locality.—Caldwell County. My collection. Rare.—[Gabb, 1860].

The specimen in the Academy of Natural Sciences, No. 13294, catalogued as type of this species does not correspond to Gabb's description. Specimen No. 13294 has an umbilicus with a rib. Gabb states the umbilicus is closed. Heilprin and Harris early examined the type so labelled and stated that the specimen and description do not correspond.

Holotype.—Probably lost.

Occurrence.—Lower Claiborne: Caldwell county, Texas (Gabb).

"*Natica* (*Euspira*) *propeconca*" de Gregorio, 1890, p. 153, pl. 15, figs. 7a, b; Cossmann, 1893, p. 26, resembles in general ap-

[209]Gardner, Julia, Univ. Texas Bull. No. 3301, p. 306, pl. 26, fig. 15, 1935.
[210]Harris, G. D., Bull. Amer. Pal. vol. 1, No. 4, p. 233, pl. 12, fig. 20, 1896; Harris, G. D., ibid, vol. III, No. 11, p. 88, pl. 11, fig. 22, 1899.

pearance *Crommium perovata* (Conrad). De Gregorio's shell does not have as many whorls and it lacks an umbilicus. It is doubtful whether this and the following *N. promovens* de Gregorio come from Claiborne. Cossmann indicated such a doubt.

"Natica (Euspira) promovens" de Gregorio, 1890, p. 154, pl. 15, figs. 6a, b; Cossmann, 1893, p. 26, resembles *Ampullina recurva* (Aldrich) but has the spire more elevated than that species.

Natica acuta Gabb in Kennedy, 1895, Acad. Nat. Sci., Phila., vol. 47, p. 116 is a nomen nudum. It is probably a typographical error of *N. arata* Gabb.

Lunatia seminula Conrad in Cossmann, 1925, p. 135 is probably a misspelling of *semilunata* Conrad.

N. semilunata var. *janthinops* Kennedy, 1895, ibid, pp. 103, 123, is a nomen nudum.

Natica lisbonensis Aldrich, 1886, Bull. Ala. Geol. Sur. No. 1, p. 46 in list is a nomen nudum. Dall, 1893, p. 371 stated that he had not seen it.

Genus AMPULLINA Bowdich, 1822[211]

Genotype by monotypy *"Ampullaria depressa"* Lamarck non Sowerby. Eocene. Paris Basin.

Ampullina recurva (Aldrich) Plate 14, figs. 7, 8

Natica recurva Aldrich, 1886, Geol. Sur. Ala., Bull. 1, p. 33, pl. 5, fig. 10; de Gregorio, 1890, p. 151, pl. 14, fig. 48.
Ampullina crassatina Lam. var. *mississippiensis* Dall, 1892, p. 375 [partim Sabine variety].
Euspira recurva (Aldrich) Cossmann, 1893, p. 26.
Ampullina recurva (Aldrich) Harris var., 1899, Bull. Amer. Pal., vol. III, No. 11, p. 92, pl. 12, fig. 1.

Shell large, globose, smooth, whorls six, spire low; suture channeled, that part of the whorls within this groove concave, rising to a shoulder. Body whorl very large, flattened on upper part, abruptly rounded below the umbilicus; aperture semilunar, rounded anteriorly and narrowed at the posterior part; callus thick, spreading over the body whorl and partially covering the umbilicus. Umbilicus large, deep, striated within, a thickened callus or rib proceeding from the lower edge of the outer lip, and rounding into the umbilicus.

Locality.—Lisbon, Ala.

The type shows on the body whorl traces of numerous revolving color lines. [Aldrich, 1886].

The species was described from the Lisbon horizon, Claiborne Eocene of Alabama but the stock began in the Sabine. In a varietal form the species attained a large size in the Claibornian

[211]Bowdich, T. E., 1822, p. 31, pl. 9, fig. 2; Dall. W. H., 1909, p. 89; Stewart, R. B., 1926, p. 330. Bowdich type is not indicated by specific name. The monotypic illustration is thought to be that of *Ampullaria depressa* Lamarck; Cox, L. R., 1927, p. 20 regards *Ampullina* Bowdich as nomen dubium.

of Texas. The Sabine specimens vary from typical, according to Prof. Harris, in the character of the umbilical rib and in being generally smaller. The umbilical area in the initial form is not so large as in *recurva* s. s. The Texan form was described by Heilprin as a distinct species, *Natica Dumblei* but is now regarded as a variety of the Alabama species.

Dall did not have a correct idea of *Ampullina mississippiensis*[212] when he referred the Sabine forms of *recurva* to the Oligocene species and in turn to *Ampullina crassatina*[213] of the Oligocene of France. The two species belong to a nonumbilicated group, at least in the adult stage, which separates them from *A. recurva*. *A mississippiensis* Conrad is the monotype of *Ampullinopsis* Conrad, 1865 (=*Megatylotus* Fischer, 1885).

Dimensions.—Height, 55 mm.; greatest diameter, 40 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Sabine: Alabama variety. Lower Claiborne: localities 103, 725 and 734 (type).

Ampullina recurva dumblei (Heilprin) Plate 14, figs. 10, 11

Natica Dumblei Heilprin, 1891, pp. 399, 404, pl. XL, fig. 3.

Shell globular, smooth; whorls about five, moderately convex, and flattened slightly on the shoulder; suture impressed; aperture about two-thirds the length of shell; columellar surface flattened; umbilicus probably wanting.

Length (height), 2.3 inches; greatest width, about the same.

Station 2, Rio Grande; one specimen, filled with matrix.

This species seems closely allied to *Natica crassatina*, Lamarck, from the Paris Basin, and may prove to be that form. It is the largest of our Eocene *Naticas;* named after the State Geologist of Texas.—[Heilprin, 1891].

This species attains a large size in the western Texas variety. The sutural area is impressed on *dumblei* as in *recurva*. *A. dumblei* is probably allied to *Ampullina* instead of *Ampullinopsis*.

Dimensions.—Height, 51 mm.; greatest diameter, 45 mm.

Holotype.—Not located.

Occurrence.—Lower Claiborne: Rio Grande, Heilprin station 2 (type); locality 754.

[212]Dall, W. H., 1892, p. 375; Conrad, T. A., 1865, p. 27.

[213]See Cossmann, M., 1925, Essais Pal. Comp., 13 liv., p. 28, pl. III, figs. 13, 27 as *Megatylotus*.

Genus **AMAURELLINA** "Bayle" Fischer, 1885[214]

Genotype by monotypy *Natica spirata* Lamarck, Eocene. Paris Basin.

Amaurellina singleyi (Harris) Plate 14, fig. 4

Amauropsis singleyi Harris, 1895, Acad. Nat. Sci., Phila. Proc., vol. 47, p. 84, pl. 9, fig. 12.

General form and size as indicated by the figure; spire pointed and high; whorls 7; body and penultimate whorls shouldered above as in *N. recurva;* umbilicus small, partially hidden by the labium; margin of the aperture sharp, reflected.

This species might be mistaken for the young of *recurva* were it not for the fact that the two have differently formed umbilici. In *recurva* there is a ridge formed by the continuation of the lower margin of the aperture that, after passing below and to the left of the umbilicus, winds up into the same as described by Aldrich. In *singleyi* the lower margin of the aperture stands out sharply. If traced upward and inward it will be found to follow the labium about one third way across the umbilicus and then to wind up into the same.

Locality.—Cedar Creek, Lee Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Collection of J. A. Singley.—[Harris, 1895].

This species is known only by the original description and figure. The figure does not show the umbilical area as Prof. Harris described the margin of the aperture, "if traced upward and inward it will be found to follow the labium about one-third way across the umbilicus and then to wind up into the same." It is on the basis of a similarity of the lower margin of the aperture, general shape and the suggestion that the margin of the aperture turning into the umbilical area might be similar to the ridge in the umbilicus of *Amaurellina spirata* (Lamarck) *A. singleyi* is so classified. I have not been able to examine the type to identify the species. Prof. F. L. Whitney of the Geology Department of the University of Texas kindly searched for the holotype.

Dimensions.—Height, 15 mm., holotype.

Holotype.—Formerly in the J. A. Singley collection, Geology Department, University of Texas. Probably lost.

Occurrence.—Lower Claiborne: Cedar Creek, Lee County, Texas .

Genus **CROMMIUM** Cossmann, 1888[215]

(*Lupia* Conrad, 1865, non Robineau-Desvoidy, 1863).

Genotype by original designation *Ampulina Willemeti* (Deshays). Eocene. Paris Basin.

[214]Fischer, P.. Man. de Conch., p. 766, 1887.
[215]Cossmann, M., 1888, p. 173.

Crommium perovatum (Conrad) Plate 14, figs. 5, 9; Plate 80, fig. 4

Ampullaria? perovata Conrad, 1846, Acad. Nat. Sci. Phila., Proc. vol. III, p. 21, pl. I, fig. 16; H. C. Lea, 1848, p. 96; Harris, 1895, p. 34; Henderson, 1935, Geol. Soc. Amer., Special Paper No. 3, p. 188.
Lupia perovata Conrad, 1865, p. 27; Conrad, 1866, p. 15.
Sigaretus? perovatus (Conrad) de Gregorio, 1890, p. 154.
Polynices (*Amauropsis*) *perovatus* (*Conrad*)? Dall, 1892, p. 377 [partim].
Amauropsis perovata (Conrad) Harris, 1895, p. 34, pl. 1, fig. 4.
Amaurellina (*Eusperocrommum*) *perovata* (Conrad) Stewart, 1926, Acad. Nat. Sci. Phila., Proc. Vol. 78, p. 338.
Pachycrommium perovata (Conrad) Woodring, 1928, p. 392.

Ovate, body whorl ventricose; spire concoidal? aperture subovate, half the length of the shell.

Locality.—Claiborne.

I possess but one imperfect specimen of this shell. It is rather elevated for an *Ampullaria;* but to this genus or to *Paludina*, the form of the aperture more nearly allies it, than to any marine genus which is known to me. —[Conrad, 1846].

Shell large, high spired, conical; whorls rounded; seven whorls on the single specimen possessed which has the apical whorls broken; parietal callus thin, slight umbilicus with only a trace of callus over the upper portion of the umbilicus; the inner lip turns slightly back over the umbilicus and continues overturned and flattened backward the length of the lip.

The holotype of this interesting species is a broken shell. The illustration by Conrad with the restored spire gives an erroneous idea of the shell. The Meyer drawing of the holotype is included herein. Prof. Harris found a fine specimen, complete except for the protoconch. He figured this shell in 1895. His figure does not reveal the slight umbilicus which is present on his specimen. It is probably because of this brief knowledge of the species that its classification has been so diversified. The writer does not agree with Dr. Woodring that the species should be referred to the same group as *Amaura guppyi* Gabb from the Miocene of Santo Domingo which is the genotype for *Pachycrommium* Woodring. The callus in *P. guppyi* (Gabb) spreads well over the umbilicus almost blending into the surface of the body whorl, and the overturned inner lip makes a ridge over the callus. Numerous specimens of all stages of growth of *guppyi* have been examined and only two young shells were found which have a trace of a groove representing where the umbilicus would be. The type of Conrad's *perovata* and Prof. Harris's shell show a slight but definite opening where the umbilicus is and the callus does not spread over the body whorl beyond the inner lip.

Amauropsis caloramans Maury[216] and *A. smithiana* Maury[216] from the Eocene of Trinidad were placed in *Pachycrommium* by Woodring. Considering the variable character of the umbilical region in such groups as *Crommium* Cossmann, 1888, genotype *Natica willemeti* Deshayes, *Amaurellina* "Bayle" Fischer, 1885, genotype *Natica spirata* Lamarck, *Euspirocrommium* Sacco, 1890, genotype *Natica elongata* Michelotti, *E. degensis* Sacco, var. and *Pachycrommium* Woodring and all with a general shape, it is of little value to identify a form such as *A. caloramans* Maury in any one of these groups. The holotype of that species has the umbilical region concealed in rock matrix and is therefore unknown. An examination of the syntypes of *A. smithiana* Maury reveals a species more like *C. perovatum* in the umbilical region. There is possibly a slighter umbilical area but the callus is not expanded more than *perovatum*. Eliminating these three Eocene species from the genus *Pachycrommium* the distribution of the genus is changed from that given by Woodring. The umbilical region of *Natica acuminata* Lamarck, Eocene of the Paris Basin is suggestive of *C. perovatum*. The umbilical opening is slight. It is doubtful if it would be called an umbilicus and the inner lip is similar in both species. Woodring included *acuminata* under *Pachycrommium*. Although the umbilical area of *acuminata* is not typical of *Pachycrommium* the species has widely spaced punctate lines on the surface of the shell. Since *P. guppyi* has a punctate surface there may be a closer relationship than one would believe at present. However *Ampullina* s. s. has a punctate surface, hence such may be a character which does not occur commonly in the *Ampullinæ*.

After examining the type spceies of the genera mentioned to which *C. perovatum* is probably related, that species seems to be more closely related to *Crommium* than to the groups which it has heretofore been classfied. The umbilical area of those genera are strikingly alike although the folding back of the inner lip is lower and extends further over. The spire of *Crommium* s. s. is not as elevated as in *perovatum*. There is a trace on some specimens of spiral sculpture on the shoulder of the body whorl of *Crommium*. *Amaurellina* has a pronounced ridge which ex-

[216]Maury, C. J., Acad. Nat. Sci., Phila., Jour., ser. 2, vol. 15, pp. 101, 103, pl. XIII, figs. 9, 11-13, 1912.

tends from the lower margin of the inner lip into the umbilicus. *Euspirocrommium* as illustrated by Sacco's figure[217] has the inner lip folded back narrowly over the full length of the lip and does not leave a gap back of it in the umbilical region.

Conrad made *A. perovata* the monotype of a new genus *Lupia* in 1865. Stewart and Woodring have shown that *Lupia* had been previously used by Robineau-Desvoidy[218] in Insects.

Without more complete work on the relationship of the genera of the Ampullinæ the author does not know the proper rank of the genera. Cossmann's grouping of 1925, Essais Pal. Comparée, with *Crommium* in generic rank is followed.

Only the portion of Dall's discussion of the species in 1892 pertaining to the Claibornian belongs under *C. perovatum*. The Ocala specimens he named *ocalana* and figured in 1916 as *Amauropsis ocalana*[219] is Jacksonian and from the cast material one cannot be certain that it belongs to the same genus as *C. perovatum* Conrad.

Another Jacksonian (Castle Hayne) species which has been confused with *perovatum* in unpublished lists is *Paludina* sp. Lyell and Sowerby[220]—*Vivipara Lyelli* Conrad, 1865, p. 32. Lyell's form does not seem to have been rediscovered by Kellum[221] who published a report on the horizon and included Lyell's locality, Wilmington, N. C. Lyell's specimen was a cast. It shows a specimen about the same size and has the spire of about the same elevation. The whorls are more rounded than *C. perovatum.*

Prof. Harris[222] described *Amauropsis jacksonensis* from Jackson, Miss., Jacksonian Eocene. It has a close relationship with *C. perovatum.* It differs "by its greater height, the well-defined shoulder on each whorl, and the absence of an umbilicus".

Dimensions.—Height, 37 mm.; greatest diameter, 25 mm.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.; Harris figured specimen Catalogue No. 2357, Paleontological Re-

[217]Sacco, F. I., Molluschi dei terreni terziarii del Piemonte e della Liguria, pt. 9, p. 10, pl. 1, figs. 11a, b, 12a, b, 1891, non *Natica elongata* Hoeninghaus, 1829; Woodring, W. P., 1928, p. 392.

[218]Robineau-Desvoidy, Histoire naturelle des Diptères, vol. 1, p. 910, 1863.

[219]Dall, W. H., U. S. Nat. Mus., Proc. vol. 51, No. 2162, p. 519, pl. 88, fig. 11, 1916 [Dall's reference should read, vol. 3, pt. II, p. 377, 1892].

[220]Lyell, Chas., Quart. Jour. Geol. Soc. Lond., vol. 1, p. 431, fig. c, 1845.

[221]Kellum, L. B. Prof. Paper. U. S. Geol. Sur., No. 143, 1926.

[222]Harris, G. D., Acad. Nat. Sci. Phila., Proc.. vol. 48, p. 474, pl. XIX, fig. 3, 1896.

search Institution.

Occurrence.—Gosport sand: locality 104.

Genus SINUM ("Bolten") Roeding, 1798[223]

Genotype by subsequent designation, Dall, 1915,[224] *Helix haliotoidea* (Linnæus) Gmelin. Recent. Western Pacific? (fide Woodring).

Sinum bilix (Conrad) Plate 15, figs. 17-20; Plate 80, fig. 7

Sigaretus bilix Conrad, 1833, Jan., Amer. Jour. Sci., vol. 23, p. 344; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 346; Dall, 1892, p. 378; Harris, 1895, p. 7; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 93, pl. 11, fig. 31.

Natica striata Lea, 1833, Dec., p. 105, pl. 4, fig. 88.

cf. *Sigaretus mississippiensis* Conrad, 1848, Acad. Nat. Sci., Phila., Jour. 2d. ser., vol. I, p. 113, pl. 11, fig. 9.

Stomatia bilix Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. 7, p. 30.

Catinus bilix Conrad, 1865, p. 27; Conrad, 1866, p. 15; Conrad, 1871, Amer. Jour. Conch., vol. VI, p. 314, pl. 13 figs. 4, 7.

Sigaretus striatus (Lea) de Gregorio, 1890, p. 154, pl. 15, fig. 9; Cossmann, 1893, p. 26 [partim].

Sigaretus bilix (Conrad) Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 147, section *Sigaretotrema* Sacco.

Shell obliquely oval, convex, with fine crowded striæ revolving in pairs. Length, one third of an inch.

Locality.—Claiborne, Alab. *London clay.*—[Conrad, 1833].

The species of *Sinum* in the Claibornian Eocene may be confused. The difficulty in the determination of the species probably arose because Conrad did not originally figure the forms and his later pictures do not bring out the differences well. DeGregorio and Cossmann have the species confused as is shown by their grouping.

S. bilix represents the most erect species. It has the greatest slope to the body whorl from the suture of the penultimate whorl. The species *bilix, declivis, arctatus* and *beatricæ* make a series which vary in the degree of obliqueness. *Beatricæ* represents the extreme in flatness of the body whorl. *S. declivis* and *arctatus* are intermediate with *declivis* nearer to *bilix* in shape and *arctatus* approaching *beatricæ.* The form of the shell in the series is constant for the species. The four species have similar nuclei of about three and a half, smooth whorls. The sculpture in all is similar. The number and character of fine, intermediate lines varies with age and individuals in all the species.

The four species occur in the Gosport sand and at various localities of the lower Claibornian. *S. bilix* and *declivis* are most and equally abundant in the Gosport sand. Both species occur

[223]Bolten, J. F., 1798, p. 14.
[224]Dall, W. H., 1915, p. 109.

in the Sabine (Wilcox) Eocene.

This species does not have the umbilicus enlarged to the extent that Cossmann must have supposed when he placed the form under *Sigaretotrema*.

As suggested by Dall *S. mississippiensis* Conrad from the Vicksburg Oligocene may be the same as *S. bilix*.

The Conrad collection of *S. bilix* consists of 8 specimens. The type which corresponds to Conrad's measurements is the smallest specimen of the collection.

Dimensions.—Height, 12 mm.; greatest diameter, 10 mm., lectotype. Height, 19 mm., greatest diameter, 17 mm., lectotype *N. striata* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; lectotype No. 5509, A. N. S. *Natica striata* Lea.

Occurrence.—Lower Claiborne: localities 136, 726, 733, 734, 778 and 803. Gosport sand: locality 104 (type).

Sinum declivis (Conrad) Plate 15, figs. 5, 6, 11, 15, 16; Plate 80, fig. 10

Sigaretus declivis Conrad, Nov. 1833, p. 45; H. C. Lea, 1848, p. 105; d' Orbigny, 1850, p. 343; Dall, 1892, p. 378; Harris, 1895, p. 15; Harris, 1899, Bull. Amer. Pal. vol. III, No. 11, p. 93, pl. 11, fig. 30; Cossmann, 1924, Essais Pal. Comp., 13 liv. p. 144 Newton Miss.. lower Claibornian, not Jocksonian as stated; non Cossmann, 1893, p. 26, pl. I, fig. 35.

Stomatia declivis Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. 7, p. 30.

Catinus declivis Conrad, 1865, p. 27; Conrad, 1866, p. 15.

Catinus bilix var. *declivus* Conrad, 1871, Amer. Jour. Conch., vol. 6, p. 314, pl. 13, fig. 2.

Sigaretus canaliculatus Heilprin, 1891, p. 399.

Obliquely suboval, with distinct impressed and intermediate fine striæ; spine slightly prominent; umbilicus small, partly closed by the callus; aperture patulous.—[Conrad, 1833].

There are 7 specimens in Conrad's type material.

The species has been discussed in connection with *S. bilix*. As far as the Harris collection reveals this species is better developed in the Claibornian below the Gosport sand than is *S. bilix*. It is common in the Moseley's Ferry, Texas material.

The *S. canaliculatum* Lam. which Conrad referred to in Fos. Sh., 1835, p. 34 as a Paris Basin Eocene species which occurs in the Claiborne, is not the same as the European species of Sowerby, 1823. The species Conrad referred to *canaliculatum* was probably *S. declivis* Conrad.

Dimensions.—Height, 17 mm., greatest diameter, 17 mm.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 708, 733 and 767. Gosport sand: locality 104 (type).

Sinum arctatus (Conrad) Plate 15, figs. 3, 9, 13, 14; Plate 80, fig. 8

Sigaretus arctatus Conrad, 1833, p. 45; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 346; Dall, 1892, p. 379; Cossmann 1925, Essais Pal. Comp., 13 liv., p. 145 [age erroneous].

Stomatia arctatus Conrad, 1854, Acad. Nat. Sci. Phila. Proc. vol. 7, p. 30.

Catinus arctatus Conrad, 1865, p. 27; Conrad, 1866, p. 15; Conrad, 1871, Amer. Jour. Conch., vol. 6, p. 314, pl. 13, figs. 6.

Discoid, with wrinkled spiral raised striæ; umbilicus very small; beneath flattened; aperture oblong -oval.—[Conrad, 1833].

This species may be distinguished from *S. bilix* and *S. declivis* in addition to the difference in shape, by the flattened nuclear whorls. The nuclear whorls in the other two species are elevated. The apical whorl in *S. beatricæ* are flattened even more than on *arctatus* and are submerged to the line of the body whorl.

The Conrad type collection consists of 2 specimens pasted on a card. The specimen on the right is selected as the lectotype.

Dimensions.—Height, 7 mm., greatest diameter, 19 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707, 708, 765 and 723. Gosport sand: locality 104 (type).

Sinum inconstans (Meyer and Aldrich) Plate 15, figs. 1, 7, 8, 12

Sigaretus inconstans Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. vol. IX, p. 42, pl. II, figs. 18, 18a; Dall, 1892, p. 379; Cossmann, 1924, Essais Pal. Comp., 13 liv., p.144.

Auriform. Flattened. Covered by elevated, flattened striæ. Three and a half whorls, the last of which is finely striated, constitute the nucleus, which is situated near the margin. Its plane does not coincide with the general plane of the shell. Umbilicus hidden by callus.

Newton.

There is only one flattened species of *Sigaretus* known from the Southern Tertiary, *Sig. arctatus* Conr. Its nucleus, however, is not marginal and lies in the plane of the shell.—]Meyer and Aldrich, 1886[.

This species may be easily distinguished from the other American Eocene species by its greater flatness. The plane of the nucleus, as Meyer and Aldrich pointed out, does not coincide with the general plane of the shell.

The type locality is Newton, Miss. The species as yet is confined to the lower Claibornian.

Dimensions.—Height, 9 mm., holotype (broken).

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 723, 728 and 770. Orangeburg district, S. C.

Sinum beatricæ, new species Plate 15, figs. 2, 4, 10

Shell small; body whorl flattened above and below, the plane of the aperture nearly on the horizontal; columellar callus overturned and spread over the umbilical area; callus continuous with the sharply reverse margin of the inner lip; such a callus and margin is characteristic of the four species of Claibornian *Sinum;* nuclear whorls smooth and flattened; surface of the post-nuclear whorls finely striated with spiral lines, which have finer, irregular lines between.

The differences between *beatricæ* and the other Claibornian species of *Sinum* have been discussed in the descriptions of those species. As known so far the species is rare.

Named in honor of Dr. Beatrice E. Bolton Huges.

Dimensions.—Height, 5 mm.; greatest diameter, 7 mm.

Holotype.—No. 2811; paratype No. 2812, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 707, 708 and 731. Gosport sand: locality 104 (type).

Genus **SIGATICA** Meyer and Aldrich, 1886[226]

Genotype by monotypy *S. Boettgeri* Meyer and Aldrich. Claibornian Eocene. Southern United States.

Sigatica boettgeri Meyer and Aldrich — Plate 14, fig. 3

Sigaretus (*Sigatica*) *Boettgeri* Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist. Jour., vol. IX, No. 2, p. 42; de Gregorio, 1890, p. 155, pl. 15; fig. 4.
Sigaretus (*Eunaticina*) *Boettgeri* (Meyer and Aldrich) Dall, 1892, p. 380; Cossmann, 1925, Essais Pal. Comp., 13 liv., p. 149-150.
Sigatica boettgeri (Meyer and Aldrich) Woodring, 1928, p. 388.

Spire nearly one third of the shell. Whorls five, flattened above. Suture distinct. Spiral lines near the margin of the umbilicus very strong.
Newton, Miss., Lisbon, Ala.,—[Meyer and Aldrich, 1886].

The original description included material from Newton, Miss. and Lisbon, Ala. The holotype came from Newton, Miss.

The writer agrees with Woodring in that *Sigatica* is not the same as *Eunaticina* Fischer and is not subgenerically related to *Sinum* (*Sigaretus*).

The genus is represented in the Sabine Eocene by *S. clarkeanus* Aldrich. Woodring described a subspecies of the recent West Indian and Floridian, *S. semisulcata* (Gray), from the Bowden Miocene of Jamaica and Cercado Miocene of Santo Domingo. He referred other eastern American species to the genus.

Dimensions.—Height, 6 mm.; greatest diameter, 6 mm., holotype.

[226]Meyer, O. and Aldrich, T. H., 1886, p. 42.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 728 (type) and 734.

Genus **EUNATICINA** Fischer, 1885[227]

(Substitute for *Naticina* Gray, 1847, nec Gray, 1840 nec Guilding, 1834.)

Genotype by monotypy *Natica papilla* Gmelin. Recent. Western Pacific.

Eunaticina erectoides Aldrich Plate 13, figs. 6, 7

Sigaretus (*Eunaticina*) *erectoides* Aldrich, 1908, Nautilus, vol. XXII, No. 8, p. 75, pl. V, figs. 8, 9.

Shell small thin, whorls five rapidly enlarging, apex somewhat twisted; the first two whorls smooth, the others covered with very numerous fine raised lines which become coarser on the body whorl. Aperture oblong, nearly twice as long as broad; outer lip slightly thickened; umbilicus channeled, and slightly open.

Lon. 6½ mm.; diam. 4 mm.

Locality.—DeSoto, Miss., Claibornian.

Remarks.—This little shell has very much the form of a small *Succinea*, and resembles in miniature the living forms of the subgenus. [Aldrich, 1908].

E. regia (Guppy)[228] occurs in the Bowden Miocene of Jamaica.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Family **XENOPHORIDÆ**

Genus **XENOPHORA** Fischer de Waldheim, 1807.[229]

Genotype by subsequent designation, Gray, 1847[230] *Trochus conchyliophorus* Born (=*X. laevigata* Fischer de Waldheim). Living. West Indies. Fossil. Eastern America.

Xenophora sp. Plate 14, figs. 1, 2, 6

The Harris collection contains a single cast of a *Xenophora* from the Claibornian at Lisbon, Ala., No. 2802, Palaeontological Research Institution. Prof. Harris in his Texas MS. illustrated a better specimen from the Claibornian of Texas. The figure is given herein. He reported specimens from Devil's Eye and Smithville, Colorado River, Bastrop county, Texas. Following Dall[231] the species was referred to the living *X. conchyliophora*

[227]Fisher, P., 1885, p. 768.

[228]Guppy, R. J. L., Proc. Sci. Assoc. Trinidad, vol. 2, no. 2, pp. 60, 61, pl. 2, fig. 6, 1873, Reprint Harris, G. D., Bull. Amer. Pal. vol. VIII, No. 35, p. 208, 1921; Dall, W. H., Trans. Wag. Free Inst. Sci. Phila., vol. 3, pl. 6, p. 1585, 1903; Woodring, W. P., p. 387.

[229]Fischer de Waldheim, G., 1807, p. 213.

[230]Gray, J. E., 1847, p. 158.

[231]Dall, W. H., 1892, p. 360.

Born of the American Atlantic Coast and the Gulf of Mexico. Dall included several fossil forms from the Cretaceous (Ripley) through to Recent under *X. conchyliophora.* Authors[232] have continued to do so. Perfect specimens occur at Woods Bluff, Ala. in the Sabine beds. The Sabine specimens are like *X. conchyliophora* in that they cement fragments and tiny shells to the whole surface of the shell, instead of the sutural and peripheral region, as is done by some species. The umbilical area is covered in the Sabine individuals with a thin callus. Such is the character of the *conchyliophora.* Shells of *Xenophora* figured by Conrad[233] from the Jackson Eocene possess similar features. The Lisbon specimen retains the cast of the umbilicus with the impression of the columella callus. This character of the cast suggests a shell with the basal region as in *X. conchyliophora.*

Heilprin[234] listed *X. confusa* Deshayes from Devil's Eye, Texas which may be the same as this species.

Xenophora lapiferens Whitfield

Onustus extensus Conrad, 1866, p. 11; fide Whitfield labels on specimens Rutgers College; non *O. extensus* Sowerby, 1821.

Xenophora latiferens Whitfield, 1892, U. S. Geol. Sur., Mon. 18, p. 227, pl. 34, figs. 6-9; Dall, 1892, p. 361.

The peculiarity of this species is the attachment of small stones to the middle of the upper surface of the whorl.

The species was described from the Shark River (Claibornian[235]) Eocene of New Jersey.

Syntypes.[236]—Figs. 6-7, pl. 34. Rutgers College, New Brunswick, N. J.

Figs. 8-9, pl. 34. American Museum of Natural History, New York City, Cat. No. 5581-1.

Xenophora humilis (Conrad) was, through an error, listed by him in 1865,[237] as from Claiborne. The species was from the "white limestone" at Claiborne Bluff which is Jacksonian.

[232]Harris, G. D., Bull. Amer. Pal., vol. III No. 11, p. 85, pl. 11, fig. 17, 1899; Gardner, Julia, Univ. Texas Bull. No. 3301, p. 298, 1935.

[233]Conrad, T. A., Acad. Nat. Sci. Phila,. Proc. vol. VII, p. 262, not pl. XVII, fig. 6, 1855; Wailes, Rept. Agr. Geol. Miss., pl. XVII, fig. 6, a, b 1854 as *Phorus reclusus.*

[234]Heilprin, A., 1891, p 400.

[235]Harris, G. D., Science, New ser., vol. XLIII, No. 1111, p. 532, 1916.

[236]Whitfield, R., New York Acad. Sci., Ann. vol. XII, p. 178, 1899; Whitfield, R. P. and Hovey, E. O., Bull. Amer. Mus. Nat. Hist., vol. XI pt. IV, p. 458, 1901.

[237]Conrad, T. A., Amer. Jour. Conch., vol. 1, p. 33, 1865 as *Onustus.*

De Gregorio[238] possessed casts of a *Xenophora* which he referred questionably to *agglutinans* Lamarck. Dall included the forms under his discussion of *conchyliophora*.

Onustus annosus Conrad[239] from the Shark River Eocene, New Jersey has been pointed out by Whitfield[240] and Dall[241] to be an *Architectonica* (*Solarium*).

Family CALYPTRÆDÆ

Genus CALYPTRÆA Lamarck,[242] 1799[243]

Genotype by monotypy *Patella chinensis* Linn. Recent. Europe.

Calyptræa aperta (Solander) Plate 16, figs. 1, 2, 3, 5

Trochus apertus Solander in Brander, 1766, p. 9, pl. I, figs. 1, 2.
Trochus opercularis Solander, ibid, fig. 3.
Calyptraea trochiformis Lamarck, 1802, Ann. Mus., vol. I, p. 385, Lamarck, 1806, ibid, vol. 7, pl. VII, figs. 3a, b, c.
Infundibulum tuberculatum Sowerby, 1812, Min. Conch., vol. I, p. 221, pl. 97, figs. 4, 5.
Infundibulum echinulatum Sowerby, 1812, ibid, fig. 2.
Infundibulum spinulosum Sowerby, 1812, ibid, fig. 6.
Infundibulum urticosum Conrad, 1833, p. 32 with vars. B, C; H. C. Lea, 1848, p. 100.
Infundibulum trochiformis Lea, 1833, p. 96, pl. 3, fig. 76.
Infundibulum trochiformis (Lam.) Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 46, pl. 16, fig. 18.
Trochita trochiformis (Lea) Conrad, 1865, p. 33; Conrad, 1866, p. 11.
Calyptraea trochiformis (Lam.) de Gregorio, 1890, p. 145, pl. 18, figs. 31, 40-47; Dall, 1892, p. 352; Dall, 1915, U. S. Nat. Mus., Bull. 90, p. 103.
Calyptræa aperta (Solander) Newton, 1891, p. 245; Cossman, 1893, p. 26.
Calyptræa aperta (Solander) Harris, 1899, Bull. Amer. Pal., vol. III, No. 11. p. 84, pl. 11, figs. 13-16.; Clark and Martin, 1901, Md. Geol. Sur. Eoc. p. 152, pl. 26, figs. 4, 5; Martin, 1904, Md. Geol. Sur., Miocene, p. 247, pl. 59, fig. 1.
Trochita tetrica Conrad, 1866, p. 28 Vicksburg.
Infundibulum trochiformis? Conrad, 1848, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. I, p. 113, lines 7, 8 misplaced p. 133, pl. 11, fig. 3.
Trochita alta Conrad, 1854, in Wailes Geol. Miss., p. 15, fig. 3 fide Dall, 1892 and 1915.
Infundibulum perarmatum Conrad, 1841, Acad. Nat. Sci., Phila., Proc. vol. 1, p. 31, pl. 1; Conrad, 1845, Fos. Med. Tert., p. 80, pl. 45, fig. 6.

Trochus (*apertus*) testa gibboso-conica exasperata obliquata subtus concava, apertura angustata.

Primo intuitu *Patellis* assimilatur illisque quæ *Labio interno* instructæ sunt. *cfr. Linn. Syst. nat. n.* 654-658. Specimina autem perfecta *spiram* ostendunt completam, *anfractus* licet pauciores quam in congeneribus; *Apertura* etjam magis coarctata est.

Testa magnitudina Juglandis sed depresior, sæpeque minor; tabulæ imposita conum formans gibbosiusculum, quo etjam a congeneribus

[238]De Gregorio, A., 1890, p. 144, pl. 13, figs. 37-39.
[239]Conrad, T. A., Amer. Jour. Conch., vol. V, p. 42, pl. 1, fig. 4, 1870.
[240]Whitfield, R. P., U. S. Geol. Sur., Mon. XVIII, p. 228, 1892.
[241]Dall, W. H., 1892, p. 362.
[242]Summary of Opinion Rendered, No. 94, International Rules of Zoological Nomenclature, Smith. Misc. Coll., vol. 73, No. 4, p. 12, 1926, *Calyptraca* Lam., 1799, mt. *Patella chinensis* L. placed in the official List of Generic Names.
[243]Lamarck, J. B., 1799, p. 78.

differt; extrene scabra, subtus laevis, concava.

Apertura angustata, lateribus magis rotundatis quam in reliquis hujus generis.—[Solander, 1766].

The Conrad type Gosport sand collection of the species consists of 9 perfect specimens.

This species runs a gamut of variation from flat shells to those of considerable height. On any of the shape variations small spines, numerous and conspicuous may develop.

No attempt is made to give the complete European synonymy of the species but authors may refer to Newton's checklist or Cossmann's works if more citations are wanted. A complete American Neogene synonymy is not given. Further references may be found in Dall or Clark and Martin.

A broken specimen from Claiborne measures 39 mm., across and 25 mm. in height.

Dimensions.—Greatest diameter, 30 mm., largest specimen of Conrad; greatest diameter, 8 mm., *C. trochiformis* (Lea).

Type.—Natural History Division of the British Museum. Conrad collection, Academy of Natural Sciences, Philadelphia, Pa.; No. 5463, A. N. S., lectotype *C. trochiformis* (Lea).

Occurrence.—England, lower Eocene-Oligocene. Paris Basin, Eocene. America, Sabine Eocene-Tampa Miocene; N. J. Miocene; Choptank Miocene, Md. (Dall). Lower Claiborne: localities 103, 707, 708, 725, 726, 728, 729, 730, 731, 733, 734 and 803. Gosport sand: locality 104.

Conrad[244] described briefly from the Orangeburg District, S. S. a *Calyptræa, Infundibulum carinatum.* Nothing further seems to have been added to the identity of the form.

Genus CREPIDULA Lamarck, 1799.[245]

Genotype by monotypy *Patella fornicata* Linn. Living East coast of the Americas; West Indies.

Crepidula lirata Conrad — Plate 16, figs. 8, 11-14

Crepidula lirata Conrad, 1833, Jan., Amer. Jour. Sci., vol. 23, p. 344; Conrad, 1834, App. in Morton, p. 4; Conrad, 1835, p. 46, pl. 16, fig. 17; H. C. Lea, 1848, p. 98; d'Orbigny, 1850, p. 370, de Gregorio, 1892, p. 146, pl. 13, figs. 49-58; Dall, 1892, p. 354; Cossmann, 1893, p. 26.

Crepidula cornu-arietes Lea, 1833, Dec., p. 97, pl. 3, fig. 77; H. C. Lea, 1848, p. 98.

Crypta lirata Conrad, 1865, p. 33; Conrad, 1866, p. 11.

[244]Conrad, T. A., Acad. Nat. Sci., Phila., Proc. vol. IV, p. 298, 1847; Conrad, T. A., ibid, Jour. 2d. ser., vol. I, p. 129, pl. 14, fig. 6, 1848; Dall, 1892, p. 353.

[245]Lamarck, J. B., 1799, p. 78.

Crepidula lirata var. *sublævigata* de Gregorio, 1892, p. 146, pl. 14, figs. 1-3.

C. lirata. Shell oblique, elevated, compressed: longitudinally ribbed; beak prominent, incurved, and turned to one side.

Locality.—Claiborne, Alab. *London Clay*.—[Conrad, 1833.]

Oblique, elevated, compressed, with longitudinal irregular costæ and transverse wrinkles; beak much produced, curved forward and laterally, subspiral at the apex; cavity very profound; aperture oblong; margin of the diaphram arcuated.

Syn. C. cornu arietis, Lea, Con. p. 97, *pl.* 3, *f.* 77.

Locality.—Claiborne, Alab.

One of the most abundant fossils at Claiborne. It was published originally in the *Amer. Jour. Science and Arts*, *v.* 23, *p.* 344.—[Conrad, 1835].

The Conrad type collection consists of 6 specimens.

Crepidula lirata is one of the most abundant species in the Gosport sand and one of the most variable. There are all degrees of smoothness, with a corresponding amount of ribbing, flattening, twisting of the beaks, constricting the aperture in the length-wise direction and the height oi the apex from the margin of the aperture. None of those variations are characteristic of any stage of growth as they can be found in young specimens as well as in different stages of maturity. Lea's specimen of *cornu-arietes* is an adult with a much twisted spire which shows strong, resting stages of growth. De Gregorio named the smooth shells *sublaevigata* but those forms are not entitled to a distinct name more than are hundreds of other specimens.

On a Lisbon, Alabama specimen the ribs along the upper, convex surface are finely nodose.

In species of the genus *Crepidula*, it is known that the shell form and sculpture are influenced by the character of the host upon which the individual is attached. A change in the mode of attachment is reflected in a change in the shell of *Crepidula*. Hence diversity unless fundamental and constant in such species as *C. lirata* does not deserve additional appelations.

Dimensions.—Height, 18 mm.; greatest diameter, 38 mm., lectotype. Height, 18 mm.; greatest diameter, 38 mm., holotype *Crepidula cornu-arietes* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5473, A. N. S., *Crepidula cornu-arietes* Lea. lectotype.

Occurrence.—Lower Claiborne: localities 707, 708, 730, 731, 734, 778 and 803 Gosport sand: locality 104.

Crepidula dumosa Conrad Plate 16, figs. 4, 6, 7, 9, 10

Crepidula dumosa Conrad, 1834, Acad. Nat. Sci. Phila., Jour., vol. VII, pt. I, p. 148; Conrad, 1834, App. in Morton, p. 4; Conrad, 1835, p. 46, pl. 16, fig. 20; H. C. Lea, 1848, p. 98; d'Orbigny, 1850, p. 370; de Gregorio, 1892, p. 146, pl. 13, fig. 48; Dall 1892, p. 354.
Crypta dumosa Conrad, 1865, p. 32; Conrad, 1866, p. 11.

Shell convex, with longitudinal costæ alternating in size, the larger ones armed with short erect spines; beak laterally curved, subspiral. Length, seven-eighths of an inch.

Locality.—Claiborne, Alabama.

This interesting species is related to *C. lirata*, nobis, (*C. cornu-arictis*, Lea,) but differs in having spines and larger costæ; the beak is more curved, though not so prominent. It also resembles *C. costata*, Morton, but the spines are more slender, and not so distinctly foliated; and the ribs are far more prominent. I found only one specimen of this species, whilst the *C. lirata* is vastly abundant and very perfect in the same locality. —[Conrad, 1834].

The fundamental difference between *lirata* and *dumosa* is not in the spinosity of specimens of *dumosa* but in the basic number and character of the ribs. There is the potentiality of developing about 2½ times as many ribs on *lirata* as on *dumosa.* The ribs on *lirata* when present broaden toward the margin but have fine interspaces. On old specimens the interspaces are wider and there is a tendency toward finer, alternating ribs. The ribs on *dumosa* are narrower with wide interspaces. On the convex back of the shell the ribs are the most prominent with interspaces about three times the width of the rib. A fine, intermediate rib occurs in the interspace. Some have the intermediate rib obsolete while others have several, fine ribs between. The young shells are commonly short and high with four or five, large, radiating ribs over the middle of the shell. These flare at the margin and have the characteristic, wide interspaces.

Probably the reason that Conrad and most of his followers did not find more of *dumosa* is that they were working with the "sand" and *dumosa* is apparently a lower Claibornian form and rarely occurs above. A large number of the ferruginous stained specimens with or without spines and old stages of growth occur from the Orangeburg district, S. C. A large representation comes from Wautubbee, Miss.

The author is indebted to Miss Helen Winchester of the Academy of Natural Sciences for the photograph of the holotype.

Dimensions.—Greatest diameter, 22 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa, *Occurrence.*—Lower Claiborne: localities 707 and 731; Gosport sand: locality 104.

Crucibulum antiquum Meyer[246] was discovered by Meyer[247] after cleaning the matrix from the shell, to be a *Balanus*.

Family **HIPPONICIDÆ**

Genus **HIPPONIX** Defrance, 1819.[248]

(*Amalthea* Schumacher, 1817 non Rafinesque, 1815.)

Genotype by subsequent designation, Gray, 1847[249] *Patella cornucopia* Lamarck. Eocene. Paris Basin.

Hipponix pygmæus Lea Plate 13, figs. 1-4, 8, 9; Plate 82, figs. 13, 14

Hipponix pygmæa Lea, 1833, p. 95, pl 3, fig. 75; Conrad, 1834, App. in Morton, p. 4; H. C. Lea, 1848, p. 100; Cossmann, 1893, p. 27; Harris, 1895, p. 38; Dall, 1915, U. S. Nat. Mus., Bull. 90, p. 104.
Capulus pygmeus d'Orbigny, 1850, p. 371.
Helcion leanus Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. IV, p. 387, pl. 67, fig. 48; Heilprin, 1890, p. 401.
Cochlolepas pygmæa (Lea) Conrad, 1865, p. 33; Conrad, 1866, p. 11 spelled *Conchloepas*.
Rotella (*Helcion*) *pigmæa* (Lea) de Gregorio, 1890, p. 147, pl. 14, figs. 4-7.
Hipponix ingrediens de Gregorio, 1890, p. 146, pl. 14, figs. 8-9.
Amalthea pygmæa (Lea) Dall, 1892, p. 359.
Hipponyx pygmæus, Cossmann, 1893, p. 27.

Shell subrotund, obliquely conical, closely ribbed; apex straight, pointed; cicatrices impressed; margin entire.

Long. diam. .2, Transv. diam. 3-20ths, Height nearly .1, of an inch. Figure magnified.

Observations.—This interesting little shell has a strong resemblance in form to *H. cornucopia* (Defrance and Blainville), *Pileopsis cornucopia* (Lamarck). I have determined to place it in that genus in consequence of its possessing the horse shoe shaped cicatrix mentioned by Blainville*, [*Manuel de Malacologie, p. 507] although I have not seen it attached to any support . . . [Lea, 1833].

This species is small compared with the type of the genus in the Paris Basin. There is one unusually large specimen from the Gosport sand which measures 8.5 mm., in greatest diameter. There is considerable variation in the shape of the shell, as to the amount of convexity. Some shells tend to thicken in the interior with a heavy callus. The radiating ribs have interspaces which vary with the age of the shell. They may be equal to or slightly larger than the size of the rib. The wide interspaces seem to be characteristic of the young forms. Ribs increase with age,

[246]Meyer, O., Ala. Geol. Sur. Bull. No. 1, pt. II, p. 68, pl. 1, fig. 11, 1886. from Claiborne, Ala.

[247]Meyer, O., Acad. Nat. Sci., Phila., Proc. vol. 39, p. 55, 1887; Dall, W. H., 1892, p. 348; de Gregorio, 1890, p. 13; Cossmann M., 1893, p. 27.

[248]Defrance, M., Jour. de Physique, vol. 88, p. 215, 1819 non Bull. Soc. Philom., p. 9, 1819, *Hipponix* [sic] fide Smith, E. A., Mal. Soc. Lond., Proc. vol. 7, p. 123, 1906.

[249]Gray, J. E., 1847, p. 157.

hence with old age the ribs are crowded. The muscle scar is typical of the genus.

The specimens from the Tampa silex beds, Ballast Pt., Fla., No. 165127 Post Collection, U. S. Nat. Mus., which Dall identified as *H. pygæmus* Lea have been examined. The specimens are excellent. The sculpture and beak is distinct from *H. pygmæus* and the Tampa specimens represent a separate species. The Tampa specimens are larger, higher and are coiled.

Gabb's figure of *H. leanus* is poor. An excellent drawing by Meyer of the holotype is here included as well as figures of other specimens of *leanus*.

The *H. leanus* Gabb is the same as *H. pygmæus* Lea. Numerous specimens of *H. pygmæus* from the Gosport sand have been compared with single specimens of *H. leanus* from different lower formations.

H. pygmæus is abundant in the Jackson Eocene. There are associated with it specimens which have more close-set radiating ribs than on typical forms. Such may represent a variety.

Dimensions.—Greatest diameter, 4 mm., lectotype; greatest diameter, 3 mm., holotype of *H. leanus* Gabb.

Lectotype.—No. 5451, Academy of Natural Sciences, Philadelphia, Pa.; No. 13265, A. N. S., holotype of *H. leanus* Gabb.

Occurrence.—Lower Claiborne: localities 725, 727 and 731. Gosport sand: locality 104 (type). Jacksonian.

Family CAPULIDÆ

Genus CAPULUS Montfort, 1810.[250]

Genotype by original designation *Capulus hungaricus=Patella ungarica* Linné. Living. Miocene-Pleistocene. Northern Europe. Living. Greenland to Florida.

Capulus expansus (Whitfield)

Velutina (Otina) expansa Whitfield, 1865, Amer. Jour. Conch., vol. 1, p. 265, pl. 27, figs. 14, 15.

Leptonotis expansa Conrad, 1866, Amer. Jour. Conch., vol. 2, p. 76, Tryon, 1883, Str. and Syst. Conch., vol. 2, p. 208, pl. 64 figs. 68, 69; Cossmann, 1893, p. 27.

Capulus complectus Aldrich, 1886, Geol. Sur. Ala., Bull. vol. 1, p. 34, pl. 6, figs. 1, 1a; de Gregorio, 1890, p. 145, pl. 14 fig. 23; Cossmann, 1893, p. 26.

Calyptræa trochiformis Dall, 1892, p. 352 part referred to *Velutina expansa;* Dall, 1915, U. S. Nat. Mus., Bull. 90, p. 103.

cf. *Amalthea complectus* Dall, 1892, p. 359.

[250]Montfort, D., 1810, pp. 54-55.

Capulus expansa (Conrad) Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 83.
Veluteria expansa (Conrad) Aldrich, 1887, Cincinnati Soc. Nat. Hist. Jour., vol. X, No. 2, p. 81.

Prof. Harris first worked out the synonymy of this much confused species. The embryo was described by Whitfield as a *Velutina.* Conrad created a new genus for the form. Dall believed the shell to be the embryonic tip of *Calyptræa trochiformis* Lam.=*C. aperta* Solander. Aldrich definitely established the age of Whitfield's shell as Sabine Eocene, from Bell's Landing, Ala. Aldrich previously named a *Capulus, C. complectus* from Woods Bluff and Hatchetigbee, Ala. Prof. Harris, in his Lignitic monograph explained that the shell of Whitfield is the embryo of *Capulus complectus* of Aldrich. The type came from the Sabine Eocene but Aldrich lists it from the lower Claibornian at Lisbon, Ala.

Holotype.—Capulus complectus Ald. Geology Department, Johns Hopkins University, Baltimore, Md.

Family LITIOPIDÆ

Genus ALABA H. and A. Adams, 1853.[251]

Genotype by subsequent designation, Nevill,[252] 1884, *A. melanura*=*Rissoa melanura* C. B. Adams. Living. West Indies.

Cossmann[253] used *Alaba picta* A. Adams (*Diala picta*) as the type of *Alaba* and dates the genus from 1865 of A. Adams. *A. melanura* (C. B. Adams and *A. trivaricosa* (C. B. Adams)= (*tervaricosa*) were the only species listed by H. and A. Adams in the original description of the genus hence *A. picta* cannot be selected as type. Woodring[254] pointed out the designaiton of type by Nevill. The other species *A. tervaricosa* has been used[255] as type of the genus by authors. Cossmann[256] used in 1921, *Gibberissoa* for those species which he had thought *Alaba*-like in 1919.

[251]Adams, H. and A., 1853, vol. I, p. 241.
[252]Nevill, G. F., 1884, p. 181.
[253]Cossmann, M. and Peyrot, A., Actes Soc. Linn. Bordeaux, tome III, liv. 2, p. 571, 1919.
[254]Woodring, W. P., 1928, p. 340.
[255]Oldroyd, Ida, Stanford Univ. Pub. Geol. Ser., vol. II, pt 3., p. 72, 1927, *trivericosa*. Original spelling is *tervaricosa*. H. and A. Adams gave *trivaricosa*.
[256]Cossmann, M., Essais Pal. Comp., 12 liv., p. 53, 1921.

"Alaba" plicato-varicosa (Heilprin) Plate 17, fig. 1

Rissoina plicato-varicosa Heilprin, 1879, Acad. Nat. Sci. Phila., Proc. vol. 31, p. 214, pl. XIII, fig. 12.

Alaba plicatovaricosa (Heilprin) Dall, 1892, p. 292.

Shell sub-turreted; whorls about seven, convex, ornamented with numerous longitudinal folds (on the body-whorl from 10 to 12), and disfigured by several prominent varices; revolving lines numerous, less prominent on the middle of the whorls; aperture ovate, produced into a short canal.

Length ¼ inch.

Claiborne, Ala.

This species closely resembles, but is less slender, than the *Rissoa inchoata*. Desh., of the Paris basin.—[Heilprin, 1879].

If it were not for the existence of varices on this species the form would more naturally fall under *Microtaphrus* Cossmann[257] section of *Pseudotaphrus*. In general outline and character of the ornamentation the species is much like *P. proavius* Cossmann of the Paris Basin Eocene but that species lacks the varices.

The type material of this species consists of three specimens including the holotype. The varices are less pronounced and the spire is less elevated on the holotype than on the other two shells. The longitudinal ribs on the holotype are regular. The spiral lines are most conspicuous just above the suture.

Dimensions.—Height, 4 mm., greatest diameter, 2 mm., holotype.

Holotype.—No. 10069/1, No. 5565/1 American Museum of Natural History, New York, N. Y.

Occurrence.—Gosport sand: Claiborne, Ala. (Heilprin).

Alaba varicifer (Cossmann) Plate 17, fig. 7

Pseudotaphrus varicifer Cossmann, 1893, p. 27, pl. 1, fig. 33, section *Microtaphrus*.

Gibborissoa varicifer Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 55.

Testa conica, multispirata, anfractibus, convexiusculis subimbricatis, sutura profunda ac superne canaliculata discretis; costulis irregularibus, angustis, rectis, antice evanescentibus, sæpe varicosis; sulcis spiralibus nonnullis, prope suturam anticam; ultimo anfractu ad peripheriam subangu loso, basi funiculis spiralibus alternatis ornata; apertura sectocircularis, labro incrassato cincta, antice pseudo canaliculata; columella recta, cum margine basali angulo conferta.

Petite coquille conique, composée d'un assez grand nombre de tours un peu convexes et faiblement imbriqués du côte antérieur, où une petite rampe accompagne la suture, qui est profondément gravée. Leur ornementation est

[257]Cossmann, M., Ann. Soc. Roy. Mal. Belgique, tome XXIII, 4th ser. tome III, p. 236, 1888 type *Pseudotaphrus proavius* Cossmann, ibid, p. 236, pl. IX, fig. 24. *Pseudotaphrus* Cossmann, ibid, p. 234 type *Rissoa buccinalis* Lamk.

formée de petites costules axiales, étroites, rectilignes, peu régulières, se transformant parfois en varices plus épaisses et disparaissant vers les derniers tours qui portent seulement quelques varices noduleuses; la partie inférieure et le milieu de chaque tour est à peu près lisse, c'est seulement sur la rampe antérieure que se montrent quatre ou cinq sillons spiraux. Le dernier tour est grand, un peu anguleux à la circonférence de la base qui est convexe, ornée de cordonnets concentriques, alternant de grosseur. L'ouverture a la forme d'un secteur circulaire, dont le centre est à l'intersection du bord basal et du bord columellaire qui sont rectilignes et forment un angle de 120° environ; le secteur de cercle est formé par le contour du labre qui est épaissi par une forte varice et qui abontit, en avant à un faux canal, ou oreillette située à troncature antérieure de la columelle. Quand les individus sont incomplets, ce qui arrive le plus souvent, la coquille parait canaliculée, et on la confondrait avec un *Cerithium* du groupe *C. terebrale*, Lamk.; mais je possède deux individus dont l'ouverture est bien conservée et présente tous les caractères de mon genre *Pseudotaphrus*, de sorte que je l'y classe, quoique ses tours de spire n'aient pas tout à fait la même ornementation que les espèces parisiennes de ce genre; elle appartient probablement à la section *Microtaphrus, nobis* (Type: *M. proavius*, Cossm.).

Dimensions: longueur probable, 6 mill., diamêtre, mill.

J'ai vainement cherché dans les espèces décrites comme *Cerithium* une forme qui puisse être assimilée à celle-ci et je m'etonne qu'elle ait échappè à toutes les recherches jusqu'à présent, car j'en possède huit individus plus ou moins incomplets. Comme elle ne porte pas de tubercules sur ses côtes, on ne peut la confondre avec la figure de *R. trigemmata*.

Loc. Claiborne, assez rare; ma coll. (pl. I, fig. 33).—[Cossmann, 1893].

The later whorls of *A. varicifer* suggest those of *A. turrita* Guppy from the Bowden Miocene of Jamaica. The Claiborne species has the axial ribs on the upper whorls of the spire more pronounced.

Dimensions.—Height, 6 mm., probably. (Cossmann).

Holotype.—Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Occurrence.—Gosport sand: Claiborne, Ala. (Cossmann).

Family RISSOIDÆ

Genus TURBOELLA Leach in Gray, 1847.[258]

Genotype by subsequent designation, Gray, 1847[259], *Turbo parvus* Montagu (=Da Costa). Living. Britain, Scandinavia to Aegean. Pliocene-Pleistocene. Great Britain.

Turboella ziga (de Gregorio) Plate 17, figs. 5, 6

Rissoa (*Alvania*) *ziga* de Gregorio, 1890, p. 133, pl. 12, figs. 7-8.
Rissoa ziga (de Gregorio) Cossmann, 1893, p. 27.
Turbella ziga (de Gregorio) Cossmann, 1921, Essais Pal. Comp., 12 liv., p. 11.

Testa minutissima, ovata, turbiformis, pupoides, laevigata, axialiter tenue multiplicata; apertura suborbiculari, circiter, 1/3 totius longitudinis; labro externo simplici, acuto, non incrassato. L. 1 mm.

[258]Gray, J. E., (W. E. Leach, 1818, in Gray) Ann. Mag. Nat. Hist., (1) vol. XX, p. 271, 1847. Authors spell *Turbella*.

[269]Gray, J. E., Proc. Zool. Soc. Lond. p. 152, 1847.

C'est une des plus petites espèces de Claiborne, néanmoins elle est bien caractérisée. Elle n'est pas à rigueur une *Alvania*, car elle n'a pas la surface treillissée, mais ce caractère n'est pas de première importance. Cette espèce me paraït très analogue de la *R. nana* Lamk. (Desh. Coq. Paris 2 ed. pl. 24, f 10-11); on pourrait peut-être la rapporter à la méme espèce.

Coll. mon Cabinet.—[De Gregorio, 1890].

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Family RISSOINIDÆ

Genus RISSOINA d'Orbigny, 1840.[260]

Genotype by monotypy *Rissoina inca* d'Orbigny. Living. Peru. Chile.

Subgenus LEAELLA Cossmann, 1921.[261]

Genotype by original designation, *Pasithea notata* "Lea" Cossmann=*Leaella Cossmanni* Aldrich (non *Pasithea notata* (Lea). Eocene. Alabama.

Rissoina (Leaella) cossmanni (Aldrich) Plate 6, fig. 4

Rissoina notata Cossmann, 1893, p. 27, pl. 1, fig. 34 non *Pasithea notata* Lea, 1833.

Eulima cossmonni Aldrich, 1910, Nautilus, vol. 24, No. 7, p. 75.

Rissoina (*Leaella*) *notata* Cossmann, 1921, Essais Pal. Comp., 12 liv., pp. 91, 92, pl. III, fig. 59-60 non *Pasithea notata* Lea, 1833.

This species which Cossmann identified as *Pasithea notata* Lea =*Melanella notata* (Lea) and made a new subgenus for it is not the same as the species of Lea (see *Melanella notata* (Lea)). Aldrich renamed the species represented by Cossmann's specimens.

Dimensions.—Height, 4 mm.; greatest diameter,, 1 mm., holotype from original figure.

Holotype.—Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Genus "ACTÆONEMA" Conrad, 1865.[262]

(*Cœlatura* Conrad, 1865, nec *Caelatura* Martens —, nec *Cœlatura* Pfeiffer, 1877=*Plegma* Gude, 1911).

Genotype by subsequent designation Cossmann,[263] 1893,*Pyramis striata* Conrad="*Actœonema striata* Conrad" Cossmann =*Pasithea sulcata* Conrad. Claibornian. United States.

Conrad in 1865, Amer. Jour. Conch., vol. I, pp. 28, 35 and

[260]d'Orbigny, A., Voy. dans L'Amer. Merid., t. 5, p. 395, 1840.
[261]Cossmann, M., Essais Pal. Comp., 12 liv., p. 91, 1921.
[262]Conrad, T. A., 1865, p. 147.
[263]Cossmann, M., 1893, p. 29.

191 created the genus *Cælatura* for *Pasithea sulcata* Lea and *Pasithea striata* Lea, placing them first in the Terebridæ and later (p. 35) in the family Actæonidæ. A genotype was not stated.

On p. 147 of the same publication Conrad described the new genus *Actæonema,* with *Cælatura* as synonymous but included only *Pasithea striata* Lea of the former genus *Cælatura.* Conrad further figured and described *A. striata.*

Several interpretations are involved in the status of *Actæonema* Conrad and the history of the names included becomes confused. Several conditions are reviewed.

Under *Actæonema* Conrad placed *Cælatura* and stressed the *Actæon*-like sculpture of the species. He suggested the *Actæon*-character of *Cælatura* when he placed the genus under the *Actæondiæ.* One could interpret that Conrad thought *Cælatura* was preoccupied. The author has not been able to find the name used previous to Conrad although it has been used since. If the name is preoccupied then *Actæonema* is a substituted name and according to the rules, "the type of either name when established becomes *ipso facto* type of the other." Cossmann in 1893[264] made the distinction between *Pasithea striata* Lea and the *Actæonema striata* Conrad but he confused the *A. striata* Conrad and *sulcata* Lea in his designation of the type of *Actæonema.* It is therefore open to question whether Cossmann designated *Pyramis striata* Conrad=*Actæonema striata* Conrad (not *Pasithea striata* Lea) or *Pasithea sulcata* Lea as type. According to the author's interpretation the two spcies are distinct and *Actæonema striata* Conrad not *Pasithea striata* Lea is probably *Tuba cancellata* H. C. Lea. In that case *Actæonema* becomes synonymous with *Tuba.* The same conclusion would be reached if *Actæonema striata* Conrad not *Pasithea striata* Lea were taken as the monotype of *Actæonema* Conrad, 1865.

Pasithea striata Lea which Conrad listed as synonymous with his *A. striata* cannot be used for the monotype of the genus because it is not the *Actæonema striata* which Conrad described and figured. See discussion of *"Pasithea striata"* Lea.

If Cossmann meant to designate *Pasithea sulcata* Lea as the type which the author believes he did, then *Actæonema* becomes a genus probably belonging with the Rissoids.

[264]Cossmann, M., 1893. p. 29.

If one interpreted that Conrad meant to separate from *Cœlatura* the *Pasithea striata* Lea as a new genus, *Pasithea sulcata* Lea would become the monotype of *Cœlatura* Conrad and *A. striata* Conrad would become the monotype of *Actæonema.*

Tryon[265] and Fischer[266] gave *Pasithea striata* Lea as an example of the genus. Such is not a type designation.

"Actæonema striata" Conrad=**Tuba cancellata** H. C. Lea (which see.)

Actæonema striata Conrad, 1865, p. 147, pl. 11, fig. 2; Conrad, 1866, p. 9; non *Pasithea striata* Lea, 1833, p. 102, pl. 4, fig. 83.
Pyramis striata (Conrad) de Gregorio, 1890, p. 161, pl. 15, fig. 39 [partim].

[Original description *Actæonema* Conrad, 1865]. Conical; volutions numerous, sculptured as in the genus *Actæon*, Montfort; aperture suboval, acutely rounded and reflected at base; peristome not continuous.

This genus has some resemblance to *Aclis,* Loven, but the sculpture is the same as in *Actæon,* and the aperture like that of many species of *Melania,* Lam.

[Original description of *A. striata* Conrad.].

Pasithea striata, Lea—Contributions to Geology.

Volutions nine, each with four transversely striated grooves, except the body whorl, which has twelve; base slightly umbilicated; labium grooved within.—[Conrad, 1865].

There is a discrepancy between Conrad's figure and description of this species. To gain a better idea of what the shell probably is, the original description of the genus *Actæonema* Conrad which accompanies the original description of the species, is given.

Conrad emphasizes the *Actæon*-like sculpture. Such is typical of *Tuba cancellata* H. C. Lea. The figure shows the spiral grooves not striated. Conrad mentions Actæon-like structure twice, hence the figure is probably not a good representation of the sculpture.

The slender figure and the description of the species suggests a close affinity with *Tuba cancellata.* There are the same number of transversely striated grooves. The holotype of *A. striata* Conrad could not be found. The author believes the form is the same as *Tuba cancellata* H. C. Lea and it is placed under that species.

[265]Tryon, G. W., Jr., Man. Conch., vol. 9, p. 53, 1887.
[266]Fischer, P., Man. de Conch., p. 779, 1887.

Conrad considered that the shell he had was the same as *Pasithea striata* Lea. Conrad's figure is suggestive of that given by Lea for *Pasithea striata* and since Lea's figure is not a good representation of the form Lea had, Conrad is justified in his determination.

The Meyer drawing of the holotype of *Pasithea striata* Lea is included herein. On first examination the specimen will be questioned as Lea's holotype but on careful comparison of details and consideration of the fact that most of Lea's small species are superficially illustrated, the specimen catalogued as holotype is probably authentic. Further discussion of *Pasithea striata* Lea is given under that species.

Conrad's *Actæonema* is therefore distinct from *Pasithea striata* Lea.

Actæonema sulcata (Lea) Plate 82, fig. 12

Pasithea sulcata Lea, 1833, p. 103, pl. 4, fig. 84; H. C. Lea, 1848, p. 103.
Cœlatura sulcata (Lea) Conrad, 1865, pp. 28, 191.
Actæonema sulcata (Lea) Conrad, 1866, p. 9; Cossmann, 1893, p. 29; Cossmann, 1921, Esssais Pal. Comp., 12 liv., p. 49, pl. II, figs. 55-56.
Pyramis sulcata (Lea) Conrad, 1834, App. in Morton, p. 4 [partim]; de Gregorio, 1890, p. 160, pl. 15, figs. 41, 42.
Rissoa sulcata (Lea) Dall, 1892, p. 341.
Littorina fervens de Gregorio, 1890, p. 133, pl. 12, fig. 12.

Shell conical, largely and transversely sulcate above; substance of the shell thin; apex obtuse; suture furrowed; whorls five, flattened; mouth subelliptical, one third the length of the shell; columella flattened at the base; margin thickened above.

Length .1, Breadth 1-20th, of an inch.

The smaller figure is of the size of nature.

Observations.—A very minute species, remarkable for its large furrows, which become obsolete on the lower part of the whorls. It differs from *striata* in being less elevated, as well as in having furrows.—[Lea, 1833].

This species is unique. The Harris collection contains specimens in all stages of growth.

Nucleus consists of two, low whorls, first whorl minute, second greatly enlarged; sculpture of the spire consists of three, well developed, spiral ribs with wide, conspicuous furrows between; sutures deeply indented, first rib of the whorl may roll over the sutural groove; three, spiral ribs and grooves occur on the upper part of the body whorl as on the whorls of the spire; spiral ribs occur over the base of the body whorl but they are smaller in size; margin of the aperture continuous, thin and slightly flaring at the edge; slight umbilicus.

Cossmann thought the *Actæonema striata* Conrad not *Pasithea striata* Lea was the same as *Pasithea sulcata* Lea. Conrad's form and *sulcata* are distinct. The most conspicuous difference is in the number of spiral ribs.

De Gregorio found a specimen in which the first, spiral ribs is crowded over the suture leaving wider spaces between the two, remaining, spiral ribs. He named the specimen *Littorina fervens.* Specimens occur in the Harris collection duplicating the sculpture of *Littorina fervens* as well as specimens which show further variation in the spacing and occurrence of the position of the ribs. De Gregorio's specimen does not justify the making of a new variety.

Dimensions.—Height 1.5 mm.; greatest diameter 1 mm., lectotype; height 3 mm.; greatest diameter 1.75 mm. (Harris collection specimens).

Lectotype.—No. 5504, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Family ARCHITECTONICIDÆ

Genus ARCHITECTONICA (Bolton) Roeding, 1798.[267]

Genotype by subsequent designation, Gray, 1847,[268] *Trochus perspectivus* Linné. Living. Indo-Pacific.

Section ARCHITECTONICA s. s.

Architectonica bellistriata Conrad Plate 17, figs. 10, 11, 14

Architectonica bellistriata Conrad, 1854, Wailes Agri. and Geol. Rept. Miss., pl. 17, figs. 2a, b; Conrad, 1855, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 261.

Solarium bellistriatum (Conrad) Dall, 1892, p. 327; Meyer, 1887, Bericht. Senckenb. Naturf. Ges., p. 18, pl. 1, fig. 18, a, b.

Discoidal, with radiating impressed lines, which frequently bifurcate and are most profound at the suture; whorls of the spire carinated below near the suture; periphery acutely carinated, margined above by two approximate raised lines, and below by a prominent lines which is slightly marked by a microscopic impressed line; base with three impressed lines, that nearest the umbilicus profound; radiating striæ interrupted by the revolving lines; base convex towards the periphery and concave towards the umbilicus.—[Conrad, 1855].

267Bolten, J. F., Roeding, P. F., 1798, p. 78.
268Gray, J. E., 1847, p. 151 error *Architectoma.*

This species represents a sturdy stock which developed a number of variations in the Clairbornian and Jacksonian Eocene. The species occurs typically in the Jackson but the Adams collection contains a specimen from the Claibornian of Texacs which is the like *bellistriata.* Prof. Harris reported the species in his Texas MS. from Moseley's Ferry Alabama Bluff and Elm Cr., between Orrell's and Evergreen rossing, Lee Co., Texas, Claibornian Eocene.

There is a note by Meyer written in the Aldrich collection of type drawings which states "my figure of *Solarium bellistriatum* Conrad [referring to his figure of 1887 listed in the synonymy] compared with type. Though not identical in *every* detail, it is the same form. O. M."

In the Vicksburg Oligocene the representative of *bellistriata* is *trilirata* Conrad[269] which probably also occurs in the Jackson. Dall[270] reported it from the Claibornian, at Wautubbee and Newton, Miss., and the Gosport sand at Claiborne, Ala. Specimens of the species have not been found in the collections studied by the author from those localities.

Occurrence.—Lower Claiborne: locality 727. Jackson: (type). Claiborne and Jackson of Arkansas.[271]

Architectonica bellistriata newtonensis (Dall) Plate 17, figs. 13, 16

Solarium bellistriatum newtonense Dall, 1892, p. 327.

Another variety of the *bellastriatum* type may be called *S.* var. *newtonense* Dall. It differs from the type by having the umbilical carina divided into two by a second narrow sulcus, and in having two adjacent narrow, inclosed spiral lines no the middle of the base, instead of a single one. The shell is small, about 5 by 10 mm. Several specimens are in the Aldrich collection from Newton, Miss. It recalls *S. cœlatura* Conr., but has a different upper surface.—[Dall, 1892].

The nucleus is large. Two, strong spiral ribs occur just above the suture, the one just above the suture is about one-half the size of the second above except on the body whorl where the two ribs are equal in strength. The larger of the two ribs begins on the first post-nuclear whorl and is continuous over all the whorls. The rib just above the suture begins inconspicuously in the sun-

269 Conrad, T. A., 1847, Acad. Nat. Sci. Phila., Proc., vol. IV, p. 282; Conrad, T. A., 1848, Acad. Nat. Sci. Phila., 2d. ser., Jour. vol. I p. 113, pl. XI, fig. 4 under *Solarium.*

270 Dall, W. H., 1892, p. 327.

271 Harris, G. D., Ann. Rept. Geol. Sur. Ark. for 1892, vol. II, p. 171, 1894.

ken area of the suture of the third whorl. Broad, oblique, longitudinal ribs occur over all the whorls, the upper end of each is pinched into a nodose condition which gives a continuous row of small nodes over the whorls just below the suture. The surface of the shell therefore has the appearance of being tucked along the posterior margin of each whorl.

Through the courtesy of Dr. Paul Bartsch of the U. S. National Museum, figures of the holotype are included. The species has not been figured previously.

Dimensions.—Height, 5 mm.; radius, 6 mm., (holotype broken).

Holotype.—No. 113532, United States National Museum, Washington, D. C.

Occurrence.—Lower Claiborne: Newton, Miss. (Dall)

Architectonica cælatura Conrad Plate 82, figs. 3, 5

Architectonica cælatura Conrad, 1865, Amer. Jour. Conch., vol. I, p. 144, pl. 11, fig. 13.
Solarium cælatura (Conrad) Dall, 1892, p. 330 [mutation *S. bellistriatum* Conrad].
Solarium elaboratum de Gregorio, 1890, p. 135, [partim], pl. 12, fig. 29.
Solarium cælaturum (Conrad) Cossmann, 1893, p. 28 [partim].

Depressed, with minute beaded, or tuberculated, revolving lines, and a larger line near the base of each volution, and one near th sutur above, smaller than the former, but more distinct than the finer lines beneath; periphery carinated; base finely striated and tuberculated, with two distant larger lines; submargin of umbilicus grooved; umbilicus small, edge crenate.

Locality.—Claiborne, Alabama.—[Conrad, 1865].

The identity of *A. cælatura* Conrad is a question. Conrad's figure of the base of the type suggests a shell similar to *A. bellistriata.* The specimen in the Academy of Natural Sciences which is labelled type of *A. cælatura* corresponds to Conrad's description but not to his figure. The Meyer drawing of the "type" is included. The matrix in the shell is gray sand not ferruginous. Meyer doubted also that the specimen came from the Gosport sand.

Dimensions.—Height, 8 mm., greatest diameter, 12.5 mm., "type."

"Type."—Academy of Natural Sciences, Philadelphia, Pa.

Architectonica textilina (Dall) Plate 17, figs. 3, 4. 9

Solarium textilinum Dall, 1892, p. 328, pl. 22, figs. 1, 2, 3.

[*S. textilinum*] from the Wahtubbee, is a moderately-sized, rather depressed shell of seven whorls beside the sunken nucleus; in front of the suture is a rather broad tubercular or fluctuated elevated band, more than half way to the periphery is another a little less in size, and the peripheral keel is a still smaller thread of the same kind; between th first two are four small threads, and between the second and the keel are several extremely fine grooves; all these are crossed by obliquely radial, close-set, deep, narrow grooves; the periphery is rather high on the whorl; the umbilical rib is broad, rope-like, with sharp oblique ridges across it; outside of the narrow umbilical sulcus three very fine and three broad articulated spirals alternate, then three fine ones, followed by a very elevated, fluctuated thread, between which and the priphral keel are four or more very fine threads; all the small threads are cut by radial grooves like those on the upper surface; the umbilicus is small, its wall deeply excavated; the aperture but for the sculpture would be rounded, the end of the umbilical rib is very deeply grooved. Alt. 6.5; diam. of shell 12.0; of umbilicus 2.0 mm. This is one of the most elegant shells of our Tertiary, and most nearly related to the Miocene *S. nuperum,* which is known by its rounded whorls, nearly channelled suture with a thick cord in front of it, and uniformly sculptured surface, with the peripheral keel nearly obsolete in the adult, so far as rising above the other sculpture is concerned.—[Dall, 1892].

Holotype.—No. 113538, United States National Museum, Washington, D. C.

Occurrence.—Lower Claiborne: Wautubbee, Miss. (Dall).

Architectonica amœna (Conrad)

Plate 17, figs. 15, 18-20, 22, 23; Plate 82, figs. 9, 16, 17

Solarium amœnum Conrad, 1833, Nov. p. 44; Conrad, 1834, App. in Morton, p. 3; Conrad, 1835, p. 49, pl. 17, fig. ; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 348; de Gregorio, 1890, p. 134, pl. 12, fig. 57; Dall, 1892, p. 328; Harris, 1895, p. 5.

Architectonica amœna Conrad, 1865, p. 29; Conrad, 1866, p. 13 [amœna].

Depressed; whorls smooth, with three raised lines at the suture, the intermediate one smallest and the outer one crenulated; periphery crenulated and bordered by a crenulated line; beneath with an elevated submarginal line; margin of the umbilicus profoundly crenulated, from which diverge numerous strong lines interrupted by two approximate impressed submarginal striæ, and two subcentral approximate impressed lines; umbilicus contracted.—[Conrad, 1833].

Discoidal; whorls carinated immediately above the suture, crenulated below the suture, and with a very minute impressed revolving line; periphery carinated, margined on either side by a groove and carinated line; base nearly flat, slightly convex, with lines radiating from the margin of the umbilicus, interrupted by two impressed submarginal lines.

Locality.—Claiborne, Alab.—[Conrad, 1835].

This species differs from *bellistriata* in having the wide marginal rib of the umbilicus cut by a midline forming two ribs. There are more spiral lines on the remainder of the base than are on the smoother surface of *bellistriata.*

Dimensions.—Height, 5 mm.; greatest diameter, 9 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 136, 727, 728, 731 and 803. Gosport sand: locality 104 (type).

Architectonica Johnsoni (Dall) Plate 17, figs. 2, 8, 12

Solarium Johnsoni Dall, 1892, p. 328, pl. 22, fig. 15, 15a.

[*S. Johnsoni*] is about the size of *S. amœnum* and somewhat more elevated; the sculpture of the spire is very similar to that of *amœnum*, but the periphery has two broad, elegantly articulated ribs, separated by a sharp groove, and the base with six or seven sharp spiral grooves, with the interspaces of the first four articulated and wider, and those outside of them gradually narrower toward the margin; the umbilicus is, like that of *amœnum*, excavated, but with strong transverse wrinkles. A shell of six whorls beside the nucleus measures: alt. 5.0; max. diam. 8.5 mm. It sometimes attains a larger size. It is from the Claiborne Sands.—[Dall, 1892].

Holotype.—No. 113544, United States National Museum, Washington, D. C.

Occurrence.—Gosport sand: locality 104.

Architectonica ianthinæ (Van Winkle)

Solarium ianthinæ Van Winkle, 1919, Bull. Amer. Pal., vol. VIII, No. 33, p. 8, pl. 1, figs. 7, 8, 9.

This species was described from poor material. However the sculpture is definitely that of a similar character as *A. bellistriata* Conrad and *A. amœna* (Conrad).

Dimensions.—Height, 36 mm.

Syntypes.—Nos. 1396 and 1397, Paleontological Research Institution.

Occurrence.—Claibornian: James River, just below City Point, Va.

Architectonica fungina (Conrad)

Plate 17, figs. 17, 21, 24; Plate 81, figs. 6-8; Plate 82, figs. 8, 10, 15

Solarium funginum Conrad, Nov. 1833, p. 44; Conrad, 1834, App. in Morton, p. 3; Conrad, 1835, p. 48, pl. 17, fig. 7; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 248; de Gregorio, 1890, p. 136, pl. 12, figs. 58, 59; Dall, 1892, p. 327; Harris, 1895, p. 12.

Solarium Henrici Lea, Dec. 1833, p. 119, pl. 4, fig. 107; H. C. Lea, 1848, p. 105; Meyer, 1885, Amer. Jr. Sci., vol. 28, p. 463; Meyer, 1887, Bericht Senck. Natur. Gesell., Frankfurt a. M., p. 18, pl. 1, 19. a. b; de Gregorio, 1890, p. 136, pl. 12, figs. 42-48; Cossmann, 1893, p. 28.

Architectonica fungina Conrad, 1865, p. 29; Conrad, 1866, p. 13.

Architectonica Henrici (Lea) Conrad, 1865, p. 29; Conrad, 1866, p. 13.

non *Solariella fungina?* Cossmann, 1893, p. 22, pl. 1, fig. 26.

non *Eumargarita* (*Solariella*) *fungina* Cossmann, 1918, Essais Pal. Comp., 11 liv., p. 261.

Convex above, flat beneath; volutions smooth, with short raised lines diverging from the suture; perihpery with an obtuse, slightly elevated, minutely crenulated carina; margin of the umbilicus profoundly crenulated, with a submarginal impressed line and diverging striæ.—[Conrad, 1833].

Discoidal; slightly convex; whorls minutely plicated at the suture, which is profound; periphery with a crenulated carina; base flat, slightly grooved near the margin; short impressed lines radiating from the umbilicus, interrupted by an impressed submarginal line.

Syn. Solarium Henrici, *Lea, Contrib. p.* 119, *pl.* 4, *f.* 107.
Locality.—Claiborne, Alab. No. 4, first ed. p. 44.—[Conrad, 1835].

The nucleus is smooth, apex depressed but not deeply when compared with that of species such as *A. alveata.* The nepionic whorls begin with a sharp, raised, longitudinal rib.

Dall suggested *A. fungina* being a form with initial *Architectonica* characters. The species is not wholly typical but the umbilical characters do show a close relationship.

Cossmann referred the species to *Solariella* but Cossmann's figure shows that he had a *Solariella* and not the *Architectonica fungina* (Conrad).

Dimensions.—Greatest diameter, 9 mm., lectotype; height, 1.5 mm., greatest diameter, 4.5 mm., lectotype *S. Henrici* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; *S. Henrici* Lea, No. 5593, A. N. S.

Occurrence.—Lower Claiborne: Wautubbee, Miss. (Dall). Gosport sand: locality 104 (type).

Seciton GRANOSOLARIUM Sacco, 1892, June.[272]

(*Solariaxis* Dall, 1892, December.)

Type by original designation *Solarium millegranum* Lamarck. Miocene, Pliocene, S. Europe.

There is little doubt but that *Granosolarium* of Sacco is the same as and has priority over *Solariaxis* Dall. Cossmann[273] worked out the relationship of the two groups but he was under the impression that Dr. Dall's name was published previous to that of Sacco, of the same year although he does not state to what month Dall's work dates. The date printed on vol. III, pt. 2 of the Trans. Wag. Free Inst. Sci. Phila., is December which would give Sacco priority in naming. A note made by Prof. Harris at the time of the distribution of pt. 2, vol. III of Dall's work, "Feb. 16, 1893 is about the true date of publication although a few copies were especially prepared a week or so previously." may be of interest and use to workers.

The genotype of *Solariaxis* Dall is *A. elaborata* (Conrad) of

[272]Sacco, F., I Molluschi dei terreni terziarii del Piemonte e della Liguria, pt. XII, p. 59, June. 1892, *Solarium millegranum* Lamarck, 1822, Anim. s. Vert., VII, p. 6=*Trochus canaliculatus* Brocchi, 1814 non Lamarck, 1804.

[273]Cossmann, M., Essais Pal. Comp., 10 liv., p. 169, 1915.

the Claibornian Eocene. Sacco listed the American species under his subgenus but he also gave *A. stalagmium* (Conrad) and *A. scrobiculatum* (Conrad) which belong elsewhere.

The group to which *A. elaborata* belongs is represented in the Italian Basin by *S. millegranum* Lamarck which occurs abundantly and with numerous varieties in the Miocene and Pliocene. It occurs also rarely in the Miocene of the Vienna Basin.[274]

Architectonica elaborata (Conrad)
Plate 18, figs. 10-19; Plate 81, figs. 9-11, 13, 14

Solarium elaboratum Conrad, 1833, Jan., Amer. Jour. Sci., vol. 23, p. 344; Conrad, 1834, App. in Morton, p. 3; Conrad, 1835, p. 47, pl. 17, fig. 4; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 348; de Gregorio, 1890, p. 135, pl. 12, figs. 25 28; Dall, 1892, p. 324 [section *Solariaxis*]; Cossmann, 1893, p. 27; Harris, 1895, p. 17; Cossmann, 1915, Essais Pal. Comp., 10 liv., p. 169, pl. VII, fig. 18-20.
Solarium ornatum Lea, 1833, Dec., p. 120, pl. 4, fig. 108; H. C. Lea, 1848, p. 106; d'Orbigny, 1850, p. 348; de Gregorio, 1890, p. 136, pl. 12, fig. 53 a, b; Dall, 1892, p. 324; non *S. ornatum* Fitten, 1836.
Solarium canaliculatum Conrad, 1834, App. in Morton, p. 3; Conrad, 1835, pp. 34, 48 [probably]; non *S. canaliculatum* Lamarck, 1804.
Architectonica elaborata Conrad, 1865, p. 29; Conrad, 1866, p. 13.
Architectonica ornata (Lea) Conrad, 1865, p. 30; Conrad, 1866, p. 13.
Solarium striato-granulatum Heilprin, 1879, Acad. Nat. Sci., Phila. Proc., vol. 31, p. 212, pl. XIII, fig. 3; Meyer, 1887, Bericht Senck. Natur. Gesell., p. 18 [sculpture variation].
Solarium (Granosolarium) elaboratum (Conrad) Sacco, 1892, I Moll. ter. terz. Piemonte Liguria, p. 60.

Shell discoid, with numerous revolving crenulated striæ of different sizes; beneath slightly channeled on the submargin, with a few strong grooves; margin of the umbilicus profoundly crenulated; the crenulations extending to the apex; aperture nearly circular. Length, one third of an inch.
Locality.—Claiborne, Ala. *London Clay.*—[Conrad, 1833].

Convex, with numerous crenulated unequal striæ; periphery acute; beneath margined by a ridge and broad furrow, with nearly smooth revolving lines, except the three nearest the umbilicus, which are crenulatd and profound; whorls within the umbilicus, with a carinated line in the middle.
S. elaboratum, *American Journ. Science*, vol. 23, p. 344.
Locality.—Claiborne, Ala.
A rare species, the young of which may be confounded with *S. canaliculatum*, Lam. occurring in the same locality, but differs in wanting the channel above, &. The latter species was inadvertently omitted from the plate.—[Conrad, 1835].

The Conrad type collection consists of four specimens. The largest is the lectotype. The specimens vary as to relative height. The type specimen is high. Two of the specimens are low forms.

The stock of *A. elaborata* presents numerous variations in sculpture which are persistent through the Claibornian and Jack-

[274]Hoernes, M., Abh. kaiser.—konig. Geol. Reich., Bd. III, p. 456, pl. 46, fig. 4, 1856.

sonian. The shape of the shell, as to relative height is not constant within a formation or even within the different ages of an individual.

A elaborata is of a high character but many individuals flatten out. The largest specimens which occur in the Harris collection are of *elaborata* s. s.

It is difficult to describe the fine details of the spiral sculpture of this group.

On the upper surface *A. elaborata* s. s. has crenulated, spiral lines or ribs over the whole surface. The ribs have wide interspaces in which there are fine, spiral threads. The first rib just below the suture line is the largest, with a large, primary, crenulated rib midway of the whorl. The other primary ribs are irregular in size. The umbilical margin of the base is coarsely crenulated. Within the umbilicus, not quite midway between the carinæ there is a crenulated spiral rib. Above the umbilical rib and the carina there may be one or more fine, spiral lines. The longitudinal lines of growth appear under the microscope as close, coarse striæ. Below the umbilical rib, they are set obliquely. Above the umbilical rib, the lines are set veritcally.

In *A. striato-granulata* the area beneath the umbilical rib is deep and sunken, i. e. the rib projects. Dall described *A. cossmanni* as having spiral lines between the carina and the umbilical rib.

The peripheral keel in *A. acuta* is sharper than in *A. elaborata* s. s.; in *striata-granulata* the spiral ribs on the base of the shell are coarser with wider interspaces than in *elaborata* and the spiral rib just in front of the peripheral keel is larger and slightly elevated, leaving a furrow below.

A. ornata (Lea) is a young specimen of *A. elaborata* (Conrad).

Through the courtesy of the American Museum of Natural History, illustrations of the holotype of *A. striato-granulata* (Heilprin) are included.

Dimensions.—Height, 15 mm.; greatest diameter, 24 mm., lectotype *A. elaborata* (Conrad). Height, 6 mm., greatest diameter, 8.5 mm., lectotype *A. ornata* (Lea). Height, 13 mm., greatest diameter, 20 mm., holotype *A. striato-granulata.*

Types.—Academy of Natural Sciences, Philadelphia, Pa., lectotype *A. elaborata* (Conrad); No. 5500 A. N. S., lectotype *A. ornata* (Lea); No. 10123/1 Hall collection, No. 5570/1 American Museum of Natural History, New York, N. Y., holotype *A. striato-granulata* (Heilprin).

Occurrence.—Lower Claiborne: localities 103, 136, 725, 727, 728, 729, 731, 758 and 766. Gosport sand: locality 104 (type). Jacksonian.

Architectonica huppertzi (Harris) Plate 20, figs. 1, 4

Solarium huppertzi Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 83, pl. 9, fig. 10a.

Size and general form of young specimens (no adults have thus far been found) as shown by figure; whorls 3; mouth roughly hexagonal, bounded by the following lines; (1) the upper margin of the whorl, extending from a bicrenulate suture to peripheral row of crenulations; (2) the exterior lateral margin of the whorl, extending from the row of crenulations just mentioned to a second or medial row; (3) the exterior sublateral margin of the whorl, extending from the medial row of crenulations to the basal row; (4) the basal margin of the whorl, extending from the basal row of crenulations to an interior sublateral row; (5) the umbilical margin; (6) the margin of contact with the penultimate whorl.

This shell is flat or discoid like the young of most members of this genus.

Locality.—Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

This species apparently belongs to the *elaborata* stock. Prof. Harris[275] figured a variety of this species from the Sabine (Wilcox) of Woods Bluff, Alabama.

Dimensions.—Greatest diameter, 4 mm. (Harris indication).

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Smithville, Texas (Harris).

Architectonica Cossmanni (Dall) Plate 18, figs. 3, 8

Solarium Cossmanni Dall, 1892, p. 324, pl. 22, figs. 14, 14a [section *Solariaxis*].

[*S. Cossmanni*] has the umbilical carina prominent and coarsely annular, with half a dozen granular riblets forming a continuous series up to the umbilical rib proper; the latter is not very prominent. The whole sculpture is sparsely granular, the whorls obtusely carinate, depressed, with two strong granular ribs behind and a row of granules before the suture. This form has seven whorls, with an elevation of 6.0 and a max. diameter of 12.5 mm. The young have fewer spirals on the umbilical wall, and the adult shows a curious wrinkling of the incremental lines in the interspaces.

[275] Harris, G. D., Acad. Nat. Sci. Phila., Proc. vol. 48, p. 477, pl. XXI, fig. 5, 1896; Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 79, pl. 11, fig. 3, 1899.

We have it from the Claiborne Sands, Gregg's Landing, Alabama, and the Eocene of Newton and the Wahtubbee Hills, Mississippi.—[Dall, 1892].

This is a species of the *elaborata* stock. Dr. Dall pointed out the distinguishing character is the presence of "half a dozen granular riblets forming a continuous series up to the umbilical rib proper; the latter is not very prominent."

Dall reported the species from the Sabine at Gregg's Landing, lower Claiborne at Newton and Wautubbee, Miss. and the Gosport sand at Claiborne, Ala. Harris[276] stated in his Lignitic gastropod monograph that he had not found the species in the Sabine. In the United States National Museum the type of the species was found to be from Claiborne, Ala. There was a young specimen in the collections from Wautubbee Hills, Clarke Co., Miss. No specimens were found from Gregg's Landing, Ala.

Holotype.—No. 113507, U. S. National Museum, Washington, D. C.

Occurrence.—Lower Claiborne: Wautubbee Hills, Clark Co., Miss., No. 113508, U. S. Nat. Mus. Gosport sand: Claiborne, Ala. (type).

Architectonica acuta Conrad Plate 20, figs. 12, 14-17

Architectonica acuta Conrad, 1854, Wailes Ag. and Geol. Miss., pl. 17, figs. 1, 1a; Conrad, 1855, Acad. Nat .Sci. Phila., Proc., vol. VII, p. 261. *Solarium acutum* (Conrad) Dall, 1892, p. 324; Cossmann, 1915, Essais Pal. Comp., 10 liv., p. 170 [section *Solariaxis*].

Much depressed, very thin and acutely carinated on the margin; convex above, lower half of the whorls somewhat excavated; revolving striæ linear, crenulated, with a minute intermediate crenulated line, and a still finer line or two in some of the interstices; base convex, flattened and somewhat excavated towards the periphery, revolving striæ linear, alternated with a medial smaller line and two minute ones, nearly smooth, except four from the umbilical margin, which rapidly increase in size towards the inner margin; the marginal line profoundly crenulated; a carinated beaded line on the middle of each whorl within the umbilicus, which is profoundly scalariform.—[Conrad, 1855].

This species described from the Jackson Eocene is one of the most beautiful of the Eocene Architectonicas of the southern United States. The Harris collection of lower Claibornian specimens of this species are like the Jackson forms in details of sculpture.

Occurrence.—Lower Claiborne: localities 724, 725, 727, 728, 730 (var.), 741 and 803. Jacksonian. (type).

[276]Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, pt. 2, p. 82, 1899.

Architectonica acuta meekiana Gabb
Plate 20, figs. 9. 11, 13; Plate 81, figs. 1, 2

Architectonica meekiana Gabb, 1860, Acad. Nat. Sci., Phila., Jour., 2d. ser., vol. IV, p. 385, pl. 67, fig. 40; Conrad, 1865, p. 30; Conrad, 1866, p. 13.
Solarium meekanum (Gabb) Heilprin, 1890, p. 400.
Solarium meekianum (Gabb) Dall, 1892, p. 324 [included under *S. acutum* section *Solariaxis*].

Discoid, whorls five, strongly carinate on the edge and somewhat rounded below; mouth subrhomboidal; umbilicus wide; surface above marked on the edge and on the middle of the whorl by two large, revolving nodose lines, and on the rest of the top by five smaller ones; between the two large ones there are numerous cross lines passing from one to the other; below, besides the ''keel'' on the edge of the whorl, there are seven ribs, one large one bordering the umbilicus and six smaller alternating ribs; in the umbilicus there is one rib on the middle of the whorl, besides the one on the edge.

Dimensions.—Height .1 in., diameter of disc .32. in. width of umbilicus .15 in.

This beautiful species, under a glass, looks as if covered with ''beading'', all the ribs having that peculiar structure. Four specimens from Caldwell Co., in my collection. One very fine one from Wheelock, in the collection of the Smithsonian Institution.—[Gabb, 1860].

The type collection consists of two broken specimens. On the basal surface of the smaller specimen there are 6 primary, spiral, beaded ribs not including the umbilical margin. The umbilical margin and next spiral rib are coarse. There are finer, intervening ribs.

Meyer drawings of specimens which have been compared with the types are included.

Dimensions.—Height, 5.5 mm.; greatest diameter, 14 mm., smaller of type specimens.

Type.—No. 13291, (two specimens) Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne. Caldwell Co. and Wheelock, Texas (Gabb); locality 733.

Architectonica vespertina Gabb Plate 18, figs. 4, 5; Plate 82, figs. 2, 4

Architectonica vespertina Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. IV, p. 384, pl. 67, fig. 39; Conrad, 1865, p. 30; Conrad, 1866, p. 13.
p. 13
ser., vol. IV, p. 384, pl. 67, fig. 39; Conrad, 1865, p. 30; Conrad, 1866,
Solarium vespertinum (Gabb) Heilprin, 1891, p. 400.
Solarium vespertina (Gabb) Dall, 1892, p. 324 [section *Solariaxis*].

Subconical; whorls four, carinated; spire low; mouth rhomboidal, umbilicus wide; suture linear and faintly undulating; surface above marked by numerous very obscure revolving lines, which show a slight tendency to carry tubercles; these are only visible under a glass; edge of body whorl bounded by a rounded carina; under surface much more distinctly striate than the upper; on the edge of the umbilicus, and on the middle of the inner side of the whorl in the umbilicus, there is a row of tubercles, and between the two rows are small revolving lines.

Dimensions.—Height .2 in., diameter of disc .55 in.

Locality.—Caldwell Co., Texas. My collection.—[Gabb, 1860].

The holotype is a broken, worn specimen. A drawing of the holotype by Meyer is included.

Dall and Harris (MS) thought that this species was related to *A. acuta* (Conrad). The published figure of the species is of little use in determination. The figure of the under surface and Gabb's description indicate an umbilical area of the *Granosolarium* type.

The sculpture of the base is composed of regular, spiral ribs with interspaces of about the same size.

Dimensions.—Height, 6 mm.; greatest diameter, 14 mm.

Holotype.—No. 13292, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: Caldwell Co., Texas (type), locality 725.

Architectonica Aldrichi (Dall) Plate 18, figs. 1, 2, 6, 7, 9

Solarium Aldrichi Dall, 1892, p. 325, pl. 22, fig. 13, 13a [section *Solariaxis*].

[*S. Aldrichi*] is another species of the same group, with beautifully compact and clear-cut sculpture. The umbilical rib and carina are equal and similar, the wall between them excavated; the carina has twenty-four strong annular tubercles, outside of which are three broad flat, and three or four thread like spirals, all, as well as the interspaces and umbilical wall, regularly wrinkled; outside of these is a more prominent thread, then a small one, then the broad, blunt peripheral carina; above there are two strong beaded threads, separated by a fine one behind, and in front of the suture a more or less conspicuous spiral, with three smaller ones in front of the latter. The shell is moderately depressed, and all the sculpture is regular and not sharply elevated. Alt. 5.5; diam. 10.5 mm. From Lisbon, Ala., and the Wahtubbee Hills —[Dall, 1892].

The type material of this species consists of three specimens including the holotype.

The basal sculpture varies as to the strength of the larger, spiral ribs next to the umbilical carina. The number of spiral ribs on the base are the same on large and small specimens but the ribs vary in size. All the specimens are consistent in having a pronounced, marginal, spiral rib, followed ventrally with a fine, revolving rib and then an enlarged, spiral rib.

Dimensions.—Height, 5 mm., greatest diameter, 10 mm., holotype. Height, 5 mm., greatest diameter, 11 mm., paratype. Height, 3.5 mm., radius, 4 mm., paratype.

Holotype.—No. 113511, United States National Museum, Washington, D. C.

Occurrence.—Lower Claiborne: "Wahtubbee Hills, east of Enterprise, Miss." (type), localities 726, 728, 731, 733 and 767.

Architectonica leana (Dall) Plate 20, figs. 2, 3, 6, 8, 10

Solarium leanum Dall, 1892, p. 325, pl. 22, fig. 12 [section *Solariaxis*]; Harris, 1899, Bull. Amer. Pal., vol. 3, No. 11, p. 81, pl. 11, fig. 6.

[*S. Leanum*] is from the Wahtubbee Eocene and one of the most attractive forms of the group. The umbilical carina is annulate with nineteen strong, transversely-keeled tubercles, separated from the strong similar umbilical rib by an excavated sulcus; the rib is prominent, and looks, to a casual inspection, as if it were the top of the umbilical wall of the whorl, which is not the case; the shell is depressed, with a wide, thin carina, blunt and slightly undulate on the edge; both the under and upper surfaces of the whorls are concave; the keel overhangs the suture in front; the base outside of the umbilical carina is smooth, with a single fine thread in the bottom of th excavation; on the summit, above the keel, are four fine beaded or undulated spirals, separated by much wider interspaces, those next the suture stronger than the other two. Alt. 5.5; diam. 11.0 mm.; the apical whorls are estimated for, being defective in the type.—[Dall, 1892].

Dorsally there is a strong, crenulated spiral rib on the margin of the body whorl and another, strong, spiral rib posteriorly, preceded by three, spiral ribs with wide interspaces. There is a fine spiral thread between the suture and first, spiral rib. Such sculpture is duplicated on the penultimate whorl.

Dr. Dall described the species from the lower Claiborne of Wautubbee, Miss. Prof. Harris collected it in the Sabine at Hatchetigbee, Ala.

Through the courtesy of Dr. Paul Bartsch, photographs of dorsal and ventral views of the holotype are included.

Dimensions.—Height, 5 mm.; greatest diameter 11 mm., holotype.

Holotype.—No. 113512, United States National Museum, Washington, D. C.

Occurrence.—Sabine: Hatchitigbee, Ala. (Harris). Lower Claiborne: locality 731 (type).

Section **PATULAXIS** Dall, 1892[277]

Genotype by original designation, *Solarium scrobiculatum* Conrad. Eocene. United States.

There is a nomenclatural problem involved in the question of the name for the section to which *A. scrobiculata* (Conrad) and related species belong. Dr. Dall made Conrad's Claiborne species the type of the section *Patulaxis* in 1892. The species does

[277]Dall, W. H., 1892, p. 326.

represent distinct sectional differences from *Architectonica* s. s. The validity of the name is complicated by Fischer in 1885[278] who made the name *Climacopoma* on hypothetical characters of *Architectonica patulum* (Lamarck) of the Paris Basin Eocene. Fischer said in regard to the name, "On trouvé dans le bassin de Paris des opercules présentant la forme caractéristique des *Torinia* (fig. 485). Deshayes en signalant ce fait intéressant a pensé que ces opercules appartenaient au *Solarium patulum,* Lamarck, mais il ne les a jamais trouvés en place. Si cette hypothèse était confirmé e le *Solarium, patulum* aurait une coquille de Solarium et un opercule de *Torinia,* et devrait constituer une coupe sous-générique pour laquelle je proposerai le nom de *Climacopoma.*"

Fischer's name was proposed on a hypothetical basis and if taken from that standpoint under the Code, opinion 2, would have no status in nomenclature.[279]

At the time of Cossmann's Essais de Pal. Comparée, 10 liv., p. 174, 1915, the relation of the *Torinia*-like operculum and the shell of *A. patulum* was still unsettled. Cossmann used Fischer's name for species with the shell characters of *A. patulum.*

A. scrobiculata (Conrad), the type of *Patulaxis* Dall is closely related to *A. patulum* (Lamarck) and both belong to the same subgroup of *Architectonica* Bolten. Whether *Climacopoma* should have priority over *Patulaxis,* is a question which one presumes should be voted upon by the nomenclatorial committee. As far as the *Climacopoma* in the sense which Fischer proposed it is concerned, it is a *nomen nudum.* Since the species which he used as monotype does have unique characters this may validate the generic name irrespective of how it was proposed. The name proposed by Dr. Dall, *Patulaxis* is used herein to stand for the subgroup.

Patulaxis is apparently represented in the Cretaceous of India by *Solarium Arcotense* Stoliczka.[280]

Architectonica scrobiculata (Conrad)

Plate 19, figs. 1-4; Plate 81, figs. 3-5, 12, 15

Solarium scrobiculatum Conrad, 1833, p. 44; H. C. Lea, 1848, p. 106;

[278]Fischer, Paul, Man. de Conch., p. 714, 1885; see Newton, R. B., 1891, p. 311 for date.

[279]Opinion 118, Int. Rules Nom. in Smith. Misc. Coll. vol. 73, No. 7, p. 20, 1931.

[280]Stoliczka, F., Pal. Indica, vol. V, pt. 1-4, p. 255, pl. XIX, figs. 29, a, b, c, d, 1867; Cossmann, M., Essais Pal. Comp., 10 liv., p. 174, 1915.

d'Orbigny, 1850, p. 348; de Gregorio, 1890, p. 137, pl. 12, figs. 20, 21; Dall, 1892, p. 326 [section *Patulaxis*]; Cossmann, 1893, p. 28; Harris, 1895, p. 40.

Solarium patulum Conrad, 1834, App. in Morton, p. 3; Conrad, 1835, p. 49, pl. 17, fig. 9; H. C. Lea, 1848, p. 106; non *Solarium patulum* Lamarck, 1804.

Architectonica texana Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser. Jour. vol. IV, p. 384, pl. 67, fig. 38; Conrad, 1865, p. 30; Conrad, 1866, p. 13.

Architectonica scrobiculata Conrad, 1865, p 30; Conrad, 1866, p. 13.

Solarium texanum (Gabb) Heilprin, 1891, p. 400; non Dall, 1892, p. 326 [partim] = *S. sylvaerupis* Harris, 1896, Acad. Nat. Sci. Phila., Proc. vol. 48, p. 477; Harris 1899, Bull. Amer. Pal., vol. III, No. 11, p. 78; Dall, 1903, p. 1653.

?Climacopoma scrobiculatum Cossmann, 1915, Eassis Pal. Comp., 10 liv., p. 174.

Slightly elevated, with smooth, somewhat concave volutions, crenulated at the sutures; periphery crenulated; beneath indented near the margin; margin of the umbilicus profoundly crenulated; aperture rhomboidal.—[Conrad, 1833].

Convex; whorls flattened or slightly concave, carinated and crenulated on the margin; base with a submarginal furrow; umbilicus patulous.

S. Patulum, Lam. Deshayes, Coq. Foss.

Locality, Claiborne, Alab.

I published this species by the name of *S. scrobiculatum*, but it appears to be identical with the *patulum*, Lam. a fossil of the Calcaire grossier at Grignon.—[Conrad, 1835].

Nucleus smooth, tip minute and sunken, enlarged anteriorly, terminates with an enlarged, distinct longitudinal rib; surface smooth except for the crenulated margin of each whorl; the shell typically convex above; some flattened specimens have a similar sculpture to the convex specimens and the flattened shell has a wafer-like appearance.

The species is close to *A. patula* (Lamarck) of the Paris Basin Eocene. Conrad in 1835 referred his species to *patula* but changed it again in the Checklists of 1865 and 1866.

As was pointed out by Prof. Harris many years ago, an examination of the type of *A. texana* shows it to be the same as *A. scrobiculata.* Harris renamed the specimens from Wood's Bluff, Ala., Sabine Eocene, which Dall included under *A. texana* in 1892.

Dimensions.—Height, 13 mm.; greatest diameter, 23 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 13290 A. N. S., holotype *A. texana* (Gabb).

Occurrence.—Lower Claiborne: localities 727, 728, 733, 765 and 766. Gosport sand: locality 104 (type).

Architectonica scrobiculata hicoria, new variety Plate 19, figs. 5-7

Nucleus and umbilicus like that of *Scrobiculata* s. s.; shell flat on top; surface above and below smooth or with faint spiral lines; the margin of the whorls above appears superficially to be crenulated as in *A. scrobiculata* s. s. with a row of fine nodes. On examination with the microscope the crenulated ornamentation is composed of three parts spirally. The center row is higher and larger, although in some cases the middle and outer rows run together, but a sharper node persists where the central line would be. The spiral ribs are crossed by short radials. A row of crenulations occurs just below the surface as in the typical species.

The species differs from *A. scrobiculata* (Con.) s. s. in character of the spiral ribs below the suture and on the periphery of the body whorl. This difference is brought out plainly in the illustrations. While in *A. scrobiculata* the spire is elevated above the greatest expansion or carination of the body whorl, in *hicoria*, the spire is not elevated and the body whorl above and below the carination as about equally expanded.

Dimensions.—Height, 2.5 mm.; greatest diameter, 8 mm. (medium).

Holotype.—No. 2844, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 724, 728 (type) and 803.

Section **STELLAXIS** Dall, 1892[281]

Type by original designation *Solarium alveatum* Conrad. Eocene. Southern United States.

Architectonica alveata (Conrad) Plate 19, figs. 8-18

Solarium alveatum Conrad, 1833, Sept. p 31; Conrad, 1834, App. in Morton, p. 3; Conrad, 1835, p. 47, pl. 17, fig. 3; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 348; de Gregorio, 1890, p. 133 pl. 12, figs. 13-19; Heilprin, 1891, p. 400; Dall, 1892, p. 326 [section *Stellaxis*]; Cossmann, 1893, p. 27; Harris, 1894, Ann. Rept. Geol. Sur. Ark. for 1892, vol. II, p. 170; Harris, 1895, p. 5; Cossmann, 1915, Essais Pal. Comp., 10 liv., p. 168, pl. VII, figs. 8-10 [section *Stellaxis;* error pl. and fig. no.].

Solarium bilineatum Lea, 1833, Dec. p. 119, pl. 4, fig. 106, H. C. Lea, 1848, p. 105.

Architectonica alveata Conrad, 1865, p. 29; Conrad, 1866, p. 13.

Shell discoidal, smooth, with two revolving striæ near the sutures; periphery of the body whorl acutely carinated; beneath obscurely striated, with an elevated carina and groove near the periphery: umbilicus with conical denticulations. Diameter 5/8 of an inch.

Locality.—Claiborne, Alab.—[Conrad, 1833].

Discoidal, smooth, with two impressed lines near the suture, which is profound; periphery acutely angulated; base flat with a carinated line

[281]Dall, W. H., 1892, p. 326.

and groove near the periphery; umbilicus with conical denticulations.
Syn. S. bilineatum, *Lea, Con. p.* 119 *pl.* 4, *f.* 106.
Locality.—Claiborne, Alab.
The most abundant species. No. 3, first ed. p. 31.—[Conrad, 1835].

The post-nuclear whorls are only slightly crenulated along the upper margin. The area of the spiral grooves along the anterior margin is delicately crenulated. The amount of crenulation varies considerably. The spiral thread which occurs on each whorl within the umbilicus as Dall pointed out is characteristic of the group. Specimens have been found which have barely a trace of the thread.

There is a variation in the presence of the two spiral lines around the anterior surface of each whorl. They gradually become fainter on the adult whorl. Gerontic individuals show no trace of the lines.

Conrad's type material consists of 4 specimens. The largest is selected as the lectotype. It is a gerontic, smooth specimen which is what Conrad represented by his figures. He described the two revolving lines near the periphery of less mature specimens. Such is the appearance of the common specimens.

The species has an analogue in the Pacific Coast Eocene, Domengine and probably Tejon of California.[282] *A. cognita* Gabb[283] The comparison was made by Gabb and subsequent authors.

The Jackson Eocene specimens of the species do not show any differences from the Claibornian forms.

The largest specimens are broken.

Dimensions.—Height, 14 mm.; greatest diameter 27.5 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707, 729, 733, 741, 747, 767 and 776. Gosport sand; locality 104 (type). Jacksonian: Mississippi.

"Architectonica" bastropensis (Harris) Plate 20, figs. 5, 7

Solarium bastropensis Harris, 1895, Acad. Nat. Sci., Phila., Proc. 47, p. 83, pl. 9, fig. 11, a.

Size and general form as indicated by the figure; whorls 4½; spire very low, marked only by the suture and a fine line just above it; body whorl depressed, somewhat carinate, marked on the periphery by three raised lines, and near the umbilicus by radiating lines of growth.

282Stewart, R., 1926, p. 343, pl. 28, figs. 7, 8.

283Gabb, Wm., Pal. Calif., vol. 1, sect. 4, p 117, pl. 20, figs. 72, 72a, c, 1864.

Locality.—Smithville, Bastrop Co., Tex.
Geological horizon.—Lower Claiborne Eocene.
Type.—Texas State Museum.—[Harris, 1895].

The genus to which this species belongs is problematical. The dorsal surface is like that of certain Architectonicas but the umbilical area is not typical. Although it suggests *Vitrinella* or related genera, it is not typical.

Dimensions.—Height, 1.5 mm.; greatest diameter, 3 mm.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Smithville, Texas (type); locality 723.

Indefinite Forms;

Solarium antrosum Conrad, 1833, p. 31; Conrad, 1834, App. in Morton, p. 3; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 348.

Shell convex, subconical, with numerous crenulated lines; periphery of the body whorl acute; beneath with about eight grooves, in each of which is a slightly elevated line: umbilicus large, crenulated upon the edge of the whorls, and with a distinct elevated line on the middle of each whorl internally: aperture angular, subquadrate. Diameter nearly an inch.
Locality.—Claiborne, Alab.
Cab. Acad. N. S.—[Conrad, 1833].

The type was not found at the Academy of Natural Sciences at Philadelphia. The species was not figured and has not been commented upon since the original description.

Solarium syrtalis Conrad, 1834, App. in Morton, p. 3; d'Orbigny, 1850, p. 348; Dall, 1892, p. 330 is a nomen nudum.

Genus OMALAXIS Deshayes, 1832[284]

(*Bifrontia* Deshayes, 1832;[285] *Homalaxis* Fischer, 1885).

Genotype by monotypy *Solarium disjunctum* Lamarck. Eocene. Paris Basin.

Omalaxis Singleyi Aldrich Plate 21, figs. 3, 7

"*Omalaxis*" *Singleyi* Aldrich, 1890, Nautilus, vol. IV, No. 3, p. 25, text fig.

Shell flat, smooth, tricarinate, one carina on each edge and one on the periphery of the body whorl; apex impressed; whorls four, but three showing above, suture deeply excavated, upper and lower part of whorls inclining toward suture. Mouth nearly quadrangular. Length 1 mm.; breadth 3 mm. Locality: Lee Co., Texas.

This is the second species now known from the Atlantic Eocene. The first was described by I. Lea from the Claiborne sand as "Orbis rotella." For the generic synonymy see Dall's "Report on the Mollusca," 1889, part 2, p. 276. Discovered by J. A. Singley, Esq., and named in his honor.

[284]Deshayes, G. P., Ency. Meth. Vers., vol. III, p. 659, 1832; Deshayes, G. P., Coq. Foss. Paris, vol. II, p. 221, 1832 *Bifrontia*. For discussion see Iredale, Proc. Mal. Soc. Lond., vol. 9, pp. 253, 256, 1911.

[285]Newton, R. B., 1891, p. 309 for correction of date.

[Aldrich, 1890].

This species is as unique in the American Eocene as the "*Orbis*" *rotella* Lea. The shell bears a certain relationship to *Omalaxis disjuncta* (Lamarck) of the Eocene of the Paris Basin but it is by no means typical. *O. singleyi* has a tricarinate shell with posterior and anterior margins parallel and with the labrum tricarinate while *disjuncta* is bicarinate, the margins not parallel and the aperture irregularly triangular.

There is a distinct cord between the nucleus and post-nuclear whorls on the type specimen which is not shown on the figure.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Claibornian: Lee County, Texas (Aldrich).

Genus PSEUDOMALAXIS Fischer, 1885.[286]
Discosolis Dall, 1892.[287]

Genotype by monotypy *P. zanclæa* (Philippi).[288]

Fossil. Italy.

Pseudomalaxis rotella (Lea) Plate 21, figs. 8, 13

Orbis rotella Lea, 1833, p. 123, pl. 4, fig. 112; H. C. Lea, 1848, p. 103; Conrad, 1865, p. 30; Conrad, 1866, p. 14; Harris 1895 p. 39; non Aldrich 1886, Geol. Sur. Ala., Bull. 1, p. 53 [=*D. verrilli* Aldrich], Harris 1899, Bull. Amer. Pal., vol. 3, No. 1, p. 82, pl. 11, figs. 9 9a.

Cyclogyra rotella (Lea) de Gregorio, 1890, p. 139, pl. 12, figs. 62, 63.

Discohelix rotella (Lea) Dall, 1892, p. 331 section *Discosolis;* Cossmann, 1893, p. 28.

Pseudomalaxis rotella (Lea) Cossmann, 1915, Essais Pal. Comp., 10 liv., 142.

Shell flat above and below, bicarinate; apex rather impressed; substance of the shell very thin; suture linear; umbilicus wide, perspective, carinate on the edge; whorls four, perfectly square; mouth quadrangular.

Length 1-20th, breadth 3-20ths, of an inch.

The smaller figure is of the size of nature.

Observations.—This curious and interesting little species is the only perfectly flat shell I am acquainted with. The *Pleurotomarium tuberculosum* of Defrance, as figured by Blainville, has in its general form some resemblance to it. Its sinus, its rounded mouth and somewhat convex spire, render it impossible to confound even the genera.—[Lea, 1833].

Orbis, the name which Lea employed for a genus was used by

[286]Fischer, P., Man. de Conch., p. 714, 1885; Monterosato, Marquis de, 1913, p. 362.

[287]Dall, W. H., 1892, p. 331.

[288]Monterosato, Marquis de, 1913, p. 362 restricted the use of Fischer to *Bifrontia? zanclæa* Philippi fossil, not as used by authors; not the designation by Iredale, T., Mal., Soc. Lond. Proc., vol. 9, p. 256, 1911 .

G. Edwards in 1771 and by Lacépède in 1800. Dall pointed out the likeness of *rotella* to a European Liassic form called *Discohelix* by Dunker[289] and also to *Pseudomalaxis zanclæa* (Philippi) a Sicilian fossil. In the east American living fauna there is a species *Omalaxis nobilis* Verrill[290] with a shell of a similar nature as that of the three, fossil forms mentioned. The operculum of *nobilis* was discovered by Verrill and described as trochoid. The operculum of *Discohelix* and of *"Orbis" rotella* are not known. Dr. Dall made a new section of *Discohelix* to receive *O. nobilis* Verrill, which he called *Discosolis* and under that name he included the Eocene *rotella* as well as *Cyclogyra tipa* de Gregorio.

A great deal of confusion has been made by authors in the use of the names *Discohelix, Omalaxis, Pseudomalaxis* and *Bifrontia.* These groups have been studied as to types by Iredale.[291]

However Monterosato[292] later from a different standpoint restricted the type of *Pseudomalaxis* to the fossil *P. zanclaea* (Philippi).

As has been pointed out by Rehder,[293] *Omalaxis nobilis* Verrill is generically similar to *P. zanclæ* (Philippi) and therefore *Discosolis* Dall becomes synonymous with *Pseudomalaxis* Fischer.

Pseudomalaxis rotella, plummeræ, and *texana* of the American Eocene; *P. nobilis,* American Recent; *P. zanclæa* (Philippi),[294] fossil of Sicily; *Discohelix calculiformis* Dunker, Lias, *Discohelix* Dixoni (Vasseur)[295], Lutetian of the Paris Basin, and 1913.
"Orbis" semiclathrata Speyer,[296] upper Oligocene, of Hokenkirche, Cassel are bicarinate, plano-spiral, closely coiled with a quadrate aperture. *P. nobilis, P. zanclæa, Discohelix semiclath-*

[289]Dunker, W., Palæontographica, Bd. I, p. 132, pl. XVIII, fig. 11, 1847 monotype *D. calculiformis* Dunker.

[290]Verrill, A. E., Conn. Acad. Arts. and Sci., Trans., vol. 6, p. 423, pl. XLIV, fig. 12, 1885.

[291]Iredale, T., Mal. Soc. Lond., Proc. vol. 9, pp. 253-257, 1911.

[292]Monterosato, Marquis de, Mal. Soc. Lond., Proc. vol. 10, p. 362, 1913.

[293]Rehder, H. A., Nautilus, vol. XLVIII, No. 4, p. 127, 1935.

[294]Philippi, R. A., 1844, vol. II, p. 225, pl. XXVIII, fig. 11, as *Bifrontia? zanclæa* nec Gray, J. E., Ann. Mag. Nat. Hist., vol. XI, p. 260, 1853 nec Hanley, S. Thes. Conch., vol. III, p. 246, pl. (v) 244, figs. 101-3, 1863.

[295]Cossmann, M. and Pissarro, G., Icon. Complète, pl. XVI, fig. 105-1,

[296]Speyer, Oscar, 1867, pp. 330-332, pl. XXXIV, figs. 9a, 9b, 9c.

rata and *P. texana* have prominent carinæ at the angles of the periphery giving the margins a crenulated appearance. *P. rotella* and *P. plummeræ, Discohelix Dixoni* and *Discohelix calculiformis* lack the spiral striations at the angles of the periphery.

D. verrilli Aldrich is a representative of the genus in the Sabine Eocene of Alabama.

Lectotype.—No. 5634, (broken) Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne. Ala.

Pseudomalaxis plummeræ, n. sp. Plate 21, figs. 9, 14, 15

Shell small, flat, bicarinate, margin rounded between carinations; composed of four whorls; suture area deeply impressed; aperture twisted from the plane of the spire.

This species differs from *P. rotella,* its nearest relative, in having the aperture twisted from the plane of the spire.

The species is represented by five specimens from Moseley's Ferry, Texas.

Named in honor of Helen Jeanne Plummer, of Austin, Texas.

Dimensions.—Height, .5 mm.; greatest diameter 1.75 mm.

Holotype.—No. 2857; paratypes Nos. 2858, 2859, Paleontological Research Institution.

Occurrence.—Lower Claiborne, Crockitt formation: locality 723.

Pseudomalaxis texana (Aldrich) Plate 21, figs. 4, 6

Discohelix texana Aldrich, 1911, Bull. Amer. Pal., vol. 5, No. 22, p. 12, pl. V, figs. 2, 3.

The nucleus of the type specimen is distinctly marked from the post-nuclear whorls by a cord. This character is not shown on the drawing of the type.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Smithville, Texas (Aldrich).

"Pseudomalaxis" tipa (de Gregorio) Plate 21, figs. 11, 12

Cyclogyra tipa de Gregorio, 1890, p. 138, pl. 12, figs. 60, 61; Dall, 1892, p. 332.

Testa subfoliacea, nummulitiformis; anfractibus circiter 7 angustis, quadrangularibus, laevigatis, ultimo ad peripheriam subcanaliculato, lateribus angulato. Diam. 7 mm.

Je ne possède de cette espèce qu'un mauvais exemplaire, mais il a un grand intéret.—(Coll. mon Cabinet).—[De Gregorio, 1890].

This form as figured by De Gregorio has twice as many whorls as *P. rotella.* The diameter is greater. The illustration bears a resemblance to the posterior surface of one figure which Cossmann[297] gives of what he calls *Discohelix sinistra* (d'Orbigny) from the Liassic of Europe . It is not like the other figures of the same species.

The data on *tipa* are too meagre to give a definite generic grouping.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Gosport sand; Claiborne, Ala. (De Gregorio).

Family SKENEIDÆ

Genus SKENEA Fleming,[298] 1825, 1828.

(*Delphinoidea* Brown, 1827 non *Delphinoidea*— mammals;[299] *asiolus* deGregorio, 1890)

Genotype by subsequent designation, Gray, 1847,[300] *Helix serpuloides* Mortagu. Living. Devonshire coast, England.

Skenea pignus (de Gregorio) Plate 21, figs. 1, 2, 5

Adeorbis (*Asiolins*) *pignus* de Gregorio, 1890, p. 139, pl. 13, figs. 1-3 [spelled *Asiolus* in heading and explanation of plates].

Ethalia pignus Dall, 1892, p. 347.

Adeorbis laevis Cossmann, 1893, p. 25 non Meyer, 1886.

Testa minutissima, lenticularis, elegans, laevigata, discoidea, depressa; anfractibus circiter 4; ultimo ad peripheriam rotundato; umbilico profundo notato, ad marginem angulato. Diam. 2 mm.

C'est une très petite espèce, dont je possède 3 exemplaires. Elle resemble beaucoup à la *Delphinula nitens* Lea sp. dont elle diffère par la taille beaucoup plus petite, l'angulation de l' ombilic etc. Elle resemble beaucoup à l'*Adeorbis brevis* Meyer (1886. Contr. Pal. Ala. Miss. p. 67, pl. 2, f. 29); elle en diffère surtout par le bord de l'ombilic anguleux.

Cette espèce me parait avoir beaucoup d'affinité avec la *Delphinula concava* H. Lea (Petersburg pl. 36, f. 20).

Coll. mon Cabinet.—[De Gregorio, 1890].

This form has been compared to *Vitrinella lævis* (Meyer) (De Gregorio erroneously wrote *brevis*) but by definition and illustration De Gregorio designated a continuous peristome. Such makes the shell distinct generically from Meyer's species. A

297Cossmann, M., Essais Pal.Comp., 10 liv., pl. V, fig. 12, 1915.

298Fleming, John, Edin. Philos. Jour., vol. XII, April, p. 246, footnote, 1825; Fleming, John, Hist. Brit. Anim. p. 313 1828; Iredale T., Mal. Soc. Lond. Proc. vol. 11 p. 291, 1914 for history of.

299Bush, K. J., 1897, p. 100.

300Gray, J. E., 1847, p. 152.

continuous peristome places the species in a genus related to *Skenea* Brown. There do not seem to be differences great enough to separate the subgenus *Asiolus* de Gregorio from *Skenea*. De-Gregorio did not designate a type but he definitely writes *Asiolus* (misspelled *Asiolins*) with *pignus* and it is the only one of the two species following the description of *Asiolus* which has the character which De Gregorio describes, "le peristome continue et dernier tour anguleux pres de l'ombilic". Therefore *Asiolus* would have a monotype *A. pignus*. The figures of De Gregorio of *A. pignus* are not consistent, fig. 2 has a continuous peristome but fig. 1 has it discontinuous.

One specimen of this species was found but it became broken before complete diagnosis was made. The umbilical and dorsal areas were as shown by DeGregorio.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Gosport sand: locality 104.

"Adeorbis" incertus (de Gregorio) Plate 21, fig. 10

Adeorbis incertus de Gregorio, 1890, p. 139, pl. 13, fig. 4; Dall, 1892, p. 347.

Testa depressa! laevigata, anfractibus 3-4; *striis accretionis confertis ornatis; peripheria rotundata. Diam.* 4 *mm.*

C'est une espèce très douteuse car à cause de sa fragilité la partie antérieure (c'est à dire la base) de mon exemplaire est cassée; ainsi je ne puis la décrire.

Cette espèce ressemble, quant à son contour, au *Planorbis obtusus* Desh. (Deshayes Coq. Paris 2 ed. pl. 47, f. 19).

Coll. mon Cabinet.—[De Gregorio, 1890].

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Gosport sand: Claiborne, Ala. (De Gregorio).

"Adeorbis" punctiformis de Gregorio Plate 2, figs. 1, 2, 3

Adeorbis punctiformis de Gregorio, 1890, p. 139, pl. 12, figs. 65-67; Dall, 1892, p. 347; Cossmann, 1893, p. 25.

Testa maxime minuta, tenuissima; discoidalis! compressa, planorbiformis; spira plana, vix utroque latere visibili, subprominula; apertura symetrica, ultimum anfractum amplectante. Diam. ½ *mill.*

C'est une espèce extrêmement intéressante: je l'ai retrouvée, comme Lea retrouva sa *Rotella nana*, en dedans d'une autre coquille. Malheureusement elle a été cassée en la dessinant, mais la figure la reproduit bien. Elle diffère de l'espèce citée par la taille beaucoup plus petite, et par la spire visible de tous deux les côtés, et planorbiforme.

Cette espèce parait avoir quelque ressemblance avec la *Delphinula obliquestriata* H. Lea (Petersburg pl. 36, f. 71). Sa forme rappelle le *Planorbis planulatus* Deshayes (Coq. Paris, 1 ed. pl. X, f. 8-10), qui appartient à un autre genre, et qui atteint un taille beaucoup plus large. Il rappelle aussi la *Valvata inflexa* Desh. (Deshayes Coq. Paris, 2 ed. pl. 24, f. 10-11).

As Cossmann suggests this form which De Gregorio named from the Gosport sand, Claiborne, Ala., is too minute to be an adult shell. Dall suggested that the specimens might be the planorboid stage of *Caecum*.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Family MELANOPSIDÆ

Genus TEXANIA, new genus.

Genotype *Cerithium texanum* Heilprin=*Texania texana* (Heilprin). Eocene. Texas.

The description of the genus is synonymous with that of the species. The genus is known as yet from the monotype only.

The sculpture of *Texania* is suggestive of the spinose variation of *Melanatria* Bowdich.[301] Bowdich did not indicate the type of *Melanatria* by name. Authors[302] have determined the species as *M. fluminea* (Gmelin), a fluviatile inhabitant of Madagascar. The figure of Bowdich is of a smooth shell, with, as his generic description designates, "three undulating sinuses" in the outline of the aperture. Fischer's figure of *M. fluminea* is a costate shell with ribs spinose posteriorly on each whorl. It is the form figured by Fischer of which the character of the longitudinal folds in *Texania* is most suggestive. Tryon[303] figured a variation of *M. fluminea* which has a smooth body whorl with costate whorls of the spire. Tryon's figure corresponds to that of the form Reeve[304] designated as *plicata*. The sculpture of *Melanatria* varies from a smooth surface to a costate surface, to a surface with longitudinal folds with vertically directed, hooked spines. Longitudinal folds with vertically hooked spines are unique in *T. texana*. The anterior notch and the basal, spiral lines as well as the general shape of the whole shell and of the individual whorls are strikingly alike in *Melanatria* and in *Texania*. In spite of the similarity noted, *Texania* differs fundamentally in the absence of the prominent, deep, posterior notch of *Melanatria*. The position of the spines differ in the two forms. In *Melanatria* there is a

301Bowdich, T. E., 1882, p. 28, pl. VI, fig. 20 not named. The genotype is a monotype which is indicated by a figure only. Gray, 1847, designated *Buccinum flumineum* as type.

302Gray, J. E., 1847, p. 153; Fischer, P., 1885, p. 702, pl. 8, fig. 26; Cossmann, M., Essais Pal. Comp., 8 liv., pp. 155-160, 1909.

303Tryon, George W., 1883, vol. II, p. 255, pl. 71 fig. 2.

304Reeve, L., Monograph *Pirena*, pl. II, fig. 9, *P. spinosa* (*madagascariensis* Lam.), fig. 10, *fluminea*, fig. 11 *plicata*, 1859. All grade together.

wide area between the position of the spines and the suture, making a wide trough along the posterior portion of the whorl with the spines projecting above the outer margin. In *Texania* the base of the spines is at the suture with the trough of *Melanatria* lacking and the spines project close to and above the suture.

The type and related Recent species of *Melanatria* occur in the rivers of Madagascar. Conditions at times in the Eocene of the Paris Basin were favorable to support a fresh water and brackish fauna so that typical species of *Melanatria* found there were probably of a similar habitat as the Recent forms. *Texania texana* is found with marine fossils.

Authors have doubted the propriety of limiting a family to a certain habitat.[305]

Texania texana (Heilprin) Plate 21, figs. 16, 21-23

Cerithium texanum Heilprin, 1891, pp. 401, 404, pl. XI, fig. 2.
cf. *Melania texana* (Heilprin) Dall, 1892, p. 286.
Goniobasis texana (Heilprin) Dall, 1892, p. 277; Aldrich, 1895, Bull. Amer. Pal., vol. I, No. 2, p. 14, pl. 2, fig. 3; Henderson, 1935, Geol. Soc. Amer. Sp. Pap. No. 3, p. 230.

Shell turreted, of the type of the well-known *Cerithium giganteum* and *C. Parisiense* of the Paris Basin, but more rapidly tapering; whorls ? in number, smooth, moderately convex, and ornamented with obtuse, widely placed, and slightly diagonal ribs, which completely traverse the whorls; aperture?

Station 5, Rio Grande. Two fragments, lacking both apex and aperture, and measuring about one and a half inches in height. Although thus imperfect I have thought best to describe the form, as it represents a well-recognized type from the European Eocene deposits which has not heretofore been generally recognized as occurring in the United States. The species is most nearly related to *Cerithium Parisiense*, of Deshayes, from which it differs in the rapidly-tapering spire.—[Heilprin, 1891].

Shell large, elongate, sides of the whorls straight; growth lines only slightly convex; aperture ovate becoming pointed at the posterior notch; small notch posteriorly with probably no canal posteriorly; the lower whorls sculptured with large, longitudinal folds, which become pinched at the suture into vertically directed spines; the occurrence of the spinose ribs vary, some specimens have them limited to the body whorl, others have them on two or three whorls; higher whorls lack the longitudinal folds and are smooth except for obscure, spiral lines below the suture; coarse, spiral ribs occur on the basal portion of the body whorl.

[305]von Ihering, H., Les Mélandiidés Américains, Jour. de Conch., vol. 57, p. 291, 1909; Oppenheim, Paul, Zeitschrift Deutschen Geol. Gesell. Bd. 46, p. 371, 1894.

This species is exceedingly interesting from the peculiar combination of characters, from ecology and from the history of its description.

Heilprin described the species from a fragment and reconstructed the shape of the form too short. Heilprin's figure shows the characteristic folds by which one may identify other fragments. Dall had a better specimen which showed that the species was more elongate than Heilprin supposed. Harris later found two specimens which lacked the aperture and apex. Harris drew a figure of his shells and reconstructed the aperture.

Aldrich illustrated a young shell and classed the species as *Goniobasis* suggesting that Heilprin's species would prove to be the same as *Goniobasis* [*Elimia*] *trigemmata* (Conrad). Although the young specimen Aldrich had, has sculpture suggestive of that of *E. trigemmata,* the holotype of *trigemmata* is an adult shell and its characters are certainly not those of *texana* Heilprin. The later collections contain five more fragments and all are more complete than heretofore described. The writer is now able to add to the knowledge of the species.

Heilprin believed the species to be a *Cerithium* (*Campanile*) and like *C. giganteum* Lamarck and *parisiense* Deshayes of the Paris Basin. From the Harris specimens one sees that the species is not a *Cerithium.* With the exception of the dying out of the spines on the upper whorls, the Texas species lacks all characters of *Cerithium.* The aperture lacks any indication of a posterior canal and the anterior canal is limited to a mere notch. Dall suggested a Melanian affinity. The sculpture is suggestive of certain Melanopsidæ particularly *Melanatria* Bowdich,[306] subgenus of *Faunus* Montfort, 1810. Several typical species occur in the Eocene of the Paris Basin.[307]

Further discussion of the species is given under the generic remarks.

Holotype.—Not found.

Occurrence.—Lower Claiborne: Sta 5, Rio-Grande (type, Heilprin); Lee County. (Harris, MS.), localities 727 and 766.

[306]Bowdich, T. E., 1822, p. 28.

[307]See Cossmann, M., and Pissarro, G., Icon. Comp. Coq. Fos. l'Eocene env. Paris, tome 2, pl. XVIII, figs. 117-5, 117-6; pl. XIX, figs. 117-7, 1910-13.

Family PSEUDOMELANIIDÆ

Genus BAYANIA (Munier-Chalmas, MS.) Fischer, 1885.[308]

Genotype by original designation Fischer, 1885, *Melania lactea* Lamarck. Eocene. Paris Basin.

"Bayania" secale (Lea) Plate 21, figs. 18-20, 24; Plate 82, fig. 7

Pasithea secale Lea, 1833, p. 100, pl. 4, fig. 79; H. C. Lea, 1848, p. 103; de Gregorio, 1890, p. 163, pl. 16 figs. 11-13.
Eulima secale (Lea) Conrad, 1865, p. 29; Conrad, 1866, p. 14.
Turbinella secale (Lea) Dall, 1892, p. 255.
Bayania secalis (Lea) Cossmann, 1893, p. 28, pl. 2, fig. 6.

Shell subulate, smooth; substance of the shell thin; apex acute; suture linear; whorls eight, flattened; mouth acutely angular above—rounded below, one third the length of the shell; columella smooth, somewhat thickened at base; outer lip edged.

Length 7-20ths, Breadth 3-20ths, of an inch.

Observations.—In this species, which is the largest of those I have noticed, the inner lip is less thickened than those which follow.—[Lea, 1833].

The shell of this species is smooth throughout its life history. The adult shell is slenderer than the young. The species in the adult stage is like the Bayanias of the Paris Basin Eocene in shape and character of the shell. The young stages of ornamentation are not the same as the French forms. Cossmann compared the form to *B. triticea* ((Ferrussac) Defrance[309]). *Secale* is like *B. triticea* but there is some doubt that the latter is a typical *Bayania*.

The species is fairly common in the "sand".

Dimensions.—Height, 9 mm.; greatest diameter, 4 mm., lectotype.

Lectotype.—No. 5635, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Bayania claibornensis (Heilprin) Plate 21, fig. 17

Melania claibornensis Heilprin, 1879, Acad. Nat. Sci., Phila. Proc., vol. 31, p. 214, pl. XIII, fig. 11; White, 1883, 3d. Ann. Rept., U. S. Geol. Sur., p. 460, pl. 28, fig. 15; de Gregorio, 1890, p. 132; Dall, 1892, p. 276; Henderson, 1935, Geol. Soc. Amer., Sp. Pap. No. 3, p. 208.
Chemnitzia claibornensis (Heilprin) Meyer, 1886; Geol. Sur. Ala., Bull. No. I, p. 70.
Turbonilla ? claibornensis (Heilprin) de Gregorio, 1890, p. 159.
Bayania claibornensis (Heilprin) Cossmann, 1909, Essais Pal. Comp. 8

[308]Fischer, P., 1885, p. 698; Tryon, G. W., Man. Conch., I ser., vol. 8, p. 266, 1886, placed the genus in the family Melanellidæ (Eulimidæ).
[309]Deshayes, G. P., Des. Coq. Fos. env. Paris, tome II, p. 107, pl. XIV, figs. 7, 8, 1825; Cossmann, M. and Pissarro, G., 1910-13, tome II, pl. XIX, fig. 121-3.

liv., p. 99; non Cossmann, 1893=*Pasithea claibornensis* Lea, 1833.

Shell elongated, turreted; whorls eight, of which the first three are smooth, and the rest furnished with longitudinal folds, those on the body-whorl terminating at about the middle; folds cut by numerous deeply impressed revolving lines, giving a somewhat imbricated appearance; mouth elongated, oval contracted above, and expanding at the base; columella broad, flattened.

Length .3 inch.

Claiborne, Ala.

This species, to which I have provisionally applied the specific name of *Claibornensis*, is doubly interesting as being the only essentially fresh-water gasteropod found in the Claiborne marine formation and of being at the same time most intimately related to a species found in the Paris basin, *Melania miata*, Deshayes. It agrees essentially with all the characters as given by Deshayes, and on comparison with his specimens will in all probability prove to be identical.—[Heilprin, 1879].

B. claibornensis was one of the two species which White in his list of the non-marine fossil mollusks of North America, based the existence of true *Melania* in the New World. The Claiborne species seems however to belong to a group of shells which are abundant in the Paris Basin, to which the name *Bayania* was given. Fischer separated the family from the Melanias and designated them as the Pseudomelaniidæ, a family of marine members in contrast to the freshwater dwellers of the Melaniidæ. The species of *Bayania* are variable in sculpture, the type having axial costæ and spiral lines on the earlier whorls and being smooth on the later whorls. The number of whorls bearing ribs is not constant, the spiral lines continue after the longitudinal folds and some specimens have the spiral ribs well developed on the lower part of the body whorl with the area above, smooth. The shell to which Heilprin compared his species originally, *M. mixta* (Desh.), is a *Bayania*. *B. subtenuistriata* (d'Orb.)[310] is closer in sculpture to *claibornensis* than *mixta*.

Dall suggested that *Bittium koeneni* Meyer[311] from the Jackson Eocene might be the same as *B. claibornensis*. *B. koeneni* as figured and specimens in the Jackson collection, reveal distinctions between the two forms. The longitudinal ribs have a sharp curve and the intersections of the spirals and axials form small nodes on *"B." koeneni* Meyer.

Holotype.—No. 10070/1, Cat. No. 5551/1 American Museum of Natural History, New York, N. Y.

Occurrence.—Gosport sand: Claiborne, Ala.

[310]Cossmann, M. and Pissarro, G., 1910-13, tome II, pl. XX, fig. 121-21.
[311]Meyer, O., Geol. Sur. Ala., vol. 1, pt. II, p. 70, pl. II, fig. 12, 1886.

Family PLEUROCERIDÆ

Genus ELIMIA H. and A. Adams, 1858.[312]

(*Goniobasis* Lea, 1862).

Genotype by subsequent designation, Pilsbry, 1896[313], *Melania acuto-carinata* Lea. Living, freshwater. Tennessee.

Elimia trigemmata (Conrad) Plate 83, fig. 6

Turbonilla (*Chemnitzia*) *trigemmata* Conrad, 1860, Acad. Nat. Sci. Phila., 2d. ser. Jour., vol. IV, p. 288, pl. 47, fig. 33.
Compsopleura trinodosa Conrad, 1865, p. 28; Conrad, 1866, p. 15 [name changed, placed in family Scalaridæ].
Goniobasis trigemmata Aldrich, 1887, Cincinnati Soc. Nat. Hist., Jour., vol. X, No. 2, pp. 78-79, [heading *Turbonilla* [*Chemnitzia trigemmata* Con.] ; Dall, 1892, p. 277; Henderson, 1935, Geol. Soc. Amer., Special Pap. No. 3, p. 230.
Scalaria ? trigemmata (Conrad) de Gregorio, 1890, p. 131, pl. 12, fig. 5.
Roissoia ? trigemmata (Conrad) Cossmann, 1893, p. 27.
Melania trigemmata (Conrad) Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 71, pl. 9, fig. 3, a, b.

Turrited; whirls [sp.] seven, convex; ribs distant, with three subequal tubercles; the ribs become obsolete towards the suture, where there are two revolving lines, minutely beaded in a line with the ribs; suture profound, an impressed line revolving immediately above; base with six revolving carinated lines.

Length 1¼ inches.

Accompanying the above are specimens of univalves, embracing the following Eocene species: *Mitra pactilis*, C., *Cancellaria gemmata*, C., *C. alveata*, C., *Calyptraphorus trinodiferus*, C. All except the last are Claiborne species.—[Conrad, 1860].

This species was first described in 1860, under the above name, but in 1865 (vol. 1, p. 27, [p. 28], Am. Jour. Conch.), a new generic name, without description, was given and the specific name altered to ''trinodosa''. The form is catalogued as:

COMPSOLPLEMA [Compsopleura] TRINODOSA, Con. The examples collected in Alabama belonging to my cabinet have lately been examined by Prof. W. H. Dall, who says in letter, ''Both Mr. Stearns and myself refer the *Turbonilla trigemmata*, Con. to the *Strepomatidæ*. It belongs to a group of living forms like *Goniobasis hallenbeckii*, Lea, *G. boykiniana - postellii*, *floridensis*, etc., of the same author. It has nothing to do with *Scalaria*''.

Having lately discovered two species of Physa described below, associated in the same beds with the above species, I am disposed to accept the opinion of Messrs. Dall and Stearns as correctly placing the above shell. It should be known as *Goniobasis trigemmata* Con. sp.—[Aldrich, 1887].

Conrad did not give a locality for this species. It has not been found in the collections studied. Prof. Harris found it in the Sabine Eocene at Woods Bluff, Ala.

Aldrich's additional notes on the species are included. In 1895

[312]Adams, H. and A., 1858, vol. I, p. 300.
[313]Pilsbry, H. A. [and Rhoads, S. N.], Acad. Nat. Sci. Phila., Proc., vol. 48, p. 496, 1896.

Aldrich believed it the same as *Cerithium texana* Heilprin.

The holotype is at the Academy of Natural Sciences, Philadelphia. It is labelled from Alabama. The matrix is a dark clay. The Meyer drawing of the holotype is included.

Dimensions.—Height, 29 mm.; greatest diameter, 12 mm., holotype.

Genus TURRITELLA Lamarck, 1799.[314]

Genotype by monotypy *Turbo terebra* Linnæus=*Turritella terabra* (Linnæus). Living. Western Pacific.

Since the work of Guillaume[315] on the classification of the Turritellas by the changes of the contour of the lines of growth, a more logical general grouping of the species is being made. The Clairbornian species do not belong to *Turritella* s. s. according to the lines of growth. The term is used here in the broad sense of the genus. Guillaume included *T. mortoni* Sabine Eocene, under his group of *T. hybrida* Deshayes. He continued Cossmann's error of giving a Claibornian age to *T. mortoni* as well as citing *T. præcincta* Conrad from the Claiborne. Cossmann[316] placed *T. mortoni* under *Haustator*, type *T. umbricataria* Lamarck. *T. mortoni* is of the *T. hybrida* group to which there has neither been given a subgeneric name nor does it fit into any previous name given to the Turritellas. Where the varieties of *mortoni* and Claibornian species develop a sharp carina anteriorly there is a strong deflection of the growth line to the right. This seems to be a secondary development. From a comparison of the apical characters of the whorls it seems that *T. carinata* and *T. ghigna* are derived from the same stock as *T. mortoni* of the Sabine, but their Claibornian characters are distinct enough for different specific names. All of the Claibornian species studied so far seem to belong to the *T. hybrida* group, although the carinated forms *T. carinata, ghigno, rina, subrina* and possibly *clevelandica* have the strong right deflection below the carina to the suture. But in such forms as *T. mortoni* which shows variation in sculpture from straight whorl

[314]Lamarck, J. B., 1799, p. 74.

[315]Guillaume, Louis, 1924; Dollfuss, G. F., Bull. Soc. Géol. de France, 4th ser. tome XXVI, fasc. 1-2, p. 27, 1926; Guillaume, L., ibid, 4th. ser. tome 26, fasc. 6, 7, 8, p. 425, 1926.

[316]Cossmann, M., Essais Pal. Comp., 9 liv., p. 114, pl. VII, fig. 12, stated Claibornian age is an error.

sides to the *post-mortoni* Harris (plate 23, figs. 8, 9, 10) strong carinated character, one sees that the lines of growth only develop the anterior deflection with the carination.

The descriptions are all written in the same form describing from the nepionic whorls to the adult stages. This is essential in the study of the Turritellidæ so that one may make sure that some species described are not merely transitional stages in the life history of the individual. Such has been a common mistake in the past in describing species of *Turritella* from insufficient material. Names have been given for species which are merely apical, or medial or adult whorls of the same or previously named species.

Key to carination of the apical whorls

In their ontogeny the Claibornian Turritellas reveal pronounced changes in sculptural patterns, which are based on fundamental types of carination of the apical whorls.

The species examined, are grouped in the respective primitive patterns. This does not include adult sculpture except where a primitive pattern persists throughout ontogeny. Apical material of some species was not available.

I. Nepionic whorls (first 3 or 4 whorls)
- A. Unicarinate
  - 1. *T. arenicola branneri* Harris
- B. Bicarinate
  - 1. *T. apita* de Gregorio
  - 2. *T. nasuta* Gabb
  - 3. *T. ghigna* de Gregorio
- C. Tricarinate
  - 1. *T. dutexata* Harris
  - 2. *T. carinata* Lea
  - 3. *T. rina,* n. sp.
  - 4. *T. rina subrina,* n. var.

II. First post-nepionic
- A. Unicarinate
  - 1. *T. apita* de Gregorio (persists)

B. Bicarinate
   1. *T. dutexata* Harris
   2. *T. rina subrina,* n. var.
C. Tricarinate
   1. *T. nasuta* Gabb
   2. *T. ghigna* de Gregorio
   3. *T. carinata* Lea
   4. *T. obruta* Conrad

Turritella carinata stock

The description and discussion of *Turritella carinata* involves the separation of two phases of the same stock of Clabornian Turritellas. For taxonomic convenience, they are classed as two species. They occur equally abundant in the Claibornian Eocene. The species begin in the lower Claiborne horizons with a fair representation and develop abundantly in the "sand" of the upper Claiborne competing with *Mesalia vetusta* Conrad in numbers.

One phase of the *carinata* stock has an extremely slender shape when young, smooth and basally carinate in old age. This is the form figured by Conrad as the Claiborne representative of the Sabine *mortoni* and it is the form figured and named by Lea *carinata.* The other phase is less slender, more rectilinear and the whorls are striated throughout its life history. This form Conrad designated as var. A. of *mortoni* but which takes the name of *ghigna,* the first of several names which De Gregorio applied to fragments of different stages in the life history of the same species.

When the intimate relation of the two lines of growth is seen, one wonders if they are not dimorphic phases of the same species. Both seem to be normal in growth, with no suggestion of pathologic conditions. Their development is the same throughout the Claibornian.

Turritella carinata Lea Plate 24, figs. 5, 6, 8, 9, 12; Plate 82; fig. 1

Turritella carinata Lea, 1833, p. 129, pl. 4, fig. 120; H. C. Lea, 1848, p. 107; Conrad, 1865, p. 32; Conrad, 1866, p. 11; de Gregorio, 1890, p. 122, pl. 11, figs. 3-6, 9 [partim]; Heilprin, 1891, p. 400; Cossmann, 1893, p. 29; Harris, 1895, p. 10, nec *T. carinata* H. C. Lea, 1841; nec H. C. Lea, 1848, p. 107 [2d. listed].
Turritella mortoni Conrad, 1835, p. 40, pl. 15, fig. 11; H. C. Lea, 1848, p. 107.

Turritella gracilis H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 97, pl. 1, fig. 12 [apical whorls]; H. C. Lea, 1848, p. 107.
? *Turritella* mut. *liga* de Gregorio, 1890, p. 126, pl. 11, fig. 22; Cossmann 1893, p. 29.

Shell turrited, transversely striate and carinate; apex acute; substance of the shell thick; suture impressed; whorls concave, carinate on the inferior part; mouth suborbicular, effuse.

Length 1.3, Breadth 9-20ths, of an inch.

Observations.—Fragments of this species were obtained quite large, together with some young ones more perfect. Some of the specimens are much more striate and carinate than others. It resembles in the superior part a species sent me by Dr. Grateloup from Dax, under the name of *strangulata* (Grateloup). In the mouth it widely differs.—[Lea, 1833].

The young specimens are slender; the nepionic whorls have three, prominent, spiral ribs, the two lower being larger; the uppermost or first ribs gradually increase in size until on the fourth or fifth whorl, the ribs are equally developed; then they decrease in size until on the average shell there is only a faint trace of sculpture on the eleventh whorl and thereafter; faint traces of intermediate lines occur between the primary ribs; some specimens show traces of sculpture on adult typical *T. carinata* shaped specimens; those are the specimens which intimate the relationship with the *ghigna* phase of the stock.

T. carinata has an extremely peculiar and interesting shape. The young specimens are slender for about 18 or 20 mm. of growth, then the angle of the apex changes suddenly, becomes much increased so that the sides of the whorls swing out to accomodate the change of inclination.

The whorls are smooth and show the growth lines quite conspicuously. The whole surface of the whorl is covered with microscopic, spiral striations. On the last whorl of adult shells, the basal line of the whorl becomes carinated.

Conrad's figure of the species is typical and shows the peculiar change in the shape of the spire. Lea's figure shows the shell as it occurs below the mid-region of the spire in the adult. But in restoring or indicating the apical whorls, the nature of the inclination has not been given correctly. H. C. Lea described and figured the apical whorls of *carinata* under the name of *T. gracilis*. The Meyer drawing of the lectotype of *T. gracilis* H. C. Lea is included.

The lectotype of *T. carinata* Lea is a smooth shell with the strong, basal carination. The duplicate material of Lea's includes specimens of typical *carinata* and *ghigna.* Conrad's collection of *T. carinata* Lea also is a mixture of the two forms.

Apical angle.—10°

Dimensions.—Greatest diameter, 12 mm., lectotype *T. carinata* Lea; height, 11 mm., greatest diameter, 3 mm., lectotype *T. gracilis* H. C. Lea.

Lectotype.—No. 5661, Academy of Natural Sciences, Philadelphia, Pa.; No. 13174, A. N. S. *T. gracilis* H. C. Lea.

Occurrence.—Lower Claiborne: localities 726, 728, 731 and 803. Gosport sand: locality 104 (type).

Turritella ghigna de Gregorio Plate 24, figs. 2, 4, 11, 13, 15; Plate 83, fig. 1

Turritella mortoni var. A. Conrad, 1835, p. 40.
Turritella monilifera H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 97, pl. 1, fig. 11 apical whorl; H. C. Lea, 1848, p. 107; non *T. monilifera* Deshayes, 1825.
Turritella ghigna de Gregorio, 1890, p. 125, pl. 11, fig. 19.
Turritella litripa de Gregorio, 1890, p. 125, pl. 11, fig. 20.
Turritella carinifera claibornensis de Gregorio, 1890, p. 126, pl. 11, fig. 24; *claibornensis* Cossman, 1893, p. 29.
Turritella hybrida de Gregorio, 1890, p. 126, pl. 11, fig. 23 non *T. hybrida* Deshayes.
? *Turritella eterina* de Gregorio, 1890, p. 126, pl. 11, figs. 34-36 [may be *carinata* Lea]; Cossmann, 1893, p. 29.

The apex is acute; the nepionic whorls have two, large, spiral ribs, medially and basally, with a trace of a posterior third; the posterior or first rib rapidly develops until about the fourth whorl, the sculpture is typically tricarinate; the ribs have a tendency to be beaded; this character is accentuated on some individuals; faint striations may occur between the primary ribs; a fourth, spiral ribs gradually develops just below the suture, this increases in size, with a decrease in size of the three, primary carinations, making four, fine lines on whorls of medium growth; considerable variation in the sculpture occurs in the later growth; a fifth, fine, spiral line may develop posteriorly and numerous, course striations occur between the primary ribs; in extreme old age the spiral threads become squamose with the crossing of the longitudinal growth lines.

Some specimens have the basal rib form a sharp carination which approaches the *carinata* phase, except that the surface is not smooth. The shells with such characters show the intimate relation between the two phases. A full series of individuals is figured to show the variations.

The apical whorls of *T. carinata* and the *ghigna* phase are similar. It is mainly on such characters that the close relationship of the two is revealed.

Although Conrad and Lea observed that there were related and associated with *T. carinata,* shells which were different in shape and more striated in sculpture, the form was not named until by De Gregorio. De Gregorio neither examined his specimens carefully nor worked out the sequence in the development of the species, otherwise he would not have overnamed the form. The first name, *ghigna,* which De Gregorio gave for part of the shell is selected to stand for the species. The particular specimen figured represents an individual of medium growth. The next name which De Gregorio used, *litripa,* represents fragments of a mature individual of the same form. The specimens figured by him can be definitely matched with specimens in the Harris collections. The distinctions are merely differences in age. De Gregorio was not careful about stating where his specimens came from and he was not careful in differentiating between the stages of the Eocene in Alabama. It is difficult in most cases to determine where some of his names belong. Cossmann,[317] in the same manner confused the Eocene stages of the United States. "Du Claibornien de Bell's Landing," "du Claibornien de Gregg's Landing" are only two of the many such classifications which lead to misinterpretations if the data are copied without the proper corrections made.

Apical Angle.—23°.

Dimensions.—Height, 15 mm.; greatest diameter, 5.5 mm., *T. monilifera* H. C. Lea, lectotype.

Holotype.—*T. ghigna* de Gregorio, De Gregorio home, Via Molo, 132, Palermo, Sicily. Lectotype *T. monilifera* H. C. Lea, No. 13175, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 728, 731 and 734. Gosport sand: locality 104, "Mr. White's Marl", Monroe County, Ala. (Aldrich).

Turritella rina, new species Plate 22 figs. 3, 4, 9

Apex acute; nepionic whorls with three, spiral ribs first or

[317]Cossmann, M., Essais Pal. Comparée, 9 liv., p. 115 1911.

posterior rib faintly developed; medial and basal ribs prominent; first rib gradually increases in size as the medial rib decreases so that with the sixth or seventh whorl the whorls are widely bicarinate with a fine line medially; basal carination is larger, protrudes more and is sharper; interspaces filled with fine striations; spiral ribs, particularly the small, medial one, are beaded on most specimens; ribs are smooth in extreme old age; with the bicarinated sculpture a fourth, fine rib develops just below the suture, between it and the first carination; accompanying the developing of the fine rib above, is the carination of the margin of the shell just above the suture; as the basal margin begins to project, the whorls become more loosely coiled, until a deep sutural groove develops on the last whorls of adult specimens; if the basal carination projects leaving a wide interspace anteriorly, the surface of the interspace is finely striated; the basal portion of the body whorl is spirally, finely striated.

There is a variation of the sculpture in the species which is of constant growth. Such forms are described under variety *subrina,* new variety.

This species is characteristic and independent in growth. It is most abundant in the lower Claiborne. It has usually in collections been labelled as a variety of *T. carinata.* It is probably a branch of the same stock as *T. mortoni* and *carinata* but it has a definite specific development. The variety *subrina* occurs associated in the lower Claiborne and so far as known is limited to it. The largest specimen of the variety is an individual 25 mm., greatest diameter, largest of any of the Clabornian Turritellas. *T. rina* is fairly common at Wautubbee, Miss., and not rare at the base of Claiborne Bluff. At Wautubbee and Hickory, Miss., the form is associated with *T. carinata* and the worn young specimens will be confused easily. In the Harris collections there are two, worn adult shells from the "sand" which seem to be *rina.*

Apical Angle.—15°—17°.

Dimensions.—Height, 47 mm.; greatest diameter, 18 mm., holotype.

Holotype.—No. 2874, paratypes Nos. 2868 and 2869, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 24, 103, (type), 708, 725, 726, 728, 731, 733, 734, 741 and 803. Gosport sand: locality 104.

Turritella rina subrina, new variety Plate 22, figs. 1, 2, 5, 7, 8, 10, 11

Shell large and robust; first nepionic whorls with three, spiral ribs, middle rib smallest; mid-rib disappears with maturity and the shell becomes bicarinate although the lower rib is at first larger; with increased age and in gerontic individuals the carinæ become equal in size and stout; above and below the suture a fine, spiral rib develops which in extreme age becomes conspicuous.

In many young individuals the spiral ribs are beaded.

The unique character of this form is the heavy bicarination of the whorls which persists throughout the life history of the individual. *T. rina,* in maturity, has the base of the whorl prominently carinated, with the bicarinations of immaturity subordinate in size to the basal carina. Fine, spiral lines persist in *T. rina.*

In *T. subrina* the intermediate, spiral rib disappears and occurs only rarely. The fine, spiral lines also become obsolete in *T. subrina.*

Apical Angle.—18°.

Syntypes.—Nos. 2866, 2867, 2870, 2871, 2873 and 2875. Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 103, 707, 708, 728, 731, 734 and 765.

Turritella rina carolina, new variety Plate 22, fig. 6

Shell large, strongly sculptured; nepionic whorls unknown; immature whorls bicarinated with the lower carina the larger; at the same stage of development there is a fine, spiral rib just below the stuture, one between the two, primary ribs and one just above the suture; in maturity, the suture becomes excavated, the fine, spiral ribs enumerated increase in size until there are five, large, revolving ribs on the penultimate and body whorls; original carina slightly larger than the intermediate ribs; only fine, spiral threads occur below the basal carina on the body whorl.

This species has the same basal pattern of sculpture as *T. rina* and *T. subrina.* It differs from *T. subrina* most conspicuously in the presence of the spiral rib developing between the two, strong carinæ. In *T. subrina* the mid-rib disappears. In *T. carolina* it increases in size.

Dimensions.—Height, 50 mm. (incomplete); greatest diameter, 16 mm.; apical angle, 15°, holoytpe.

Holotype.—No. 2872, Paleontological Research Institution.
Occurrence.—Lower Claiborne: locality 707.

Turritella mortoni turneri Plummer Plate 23, figs. 3-5, 7

Turritella mortoni var. Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 75 [Lisbon, Ala.].
Turritella turneri Plummer, 1933, Univ. Texas Bull. No. 3232, p. 815, pl. X, fig. 10.

Apical angle 17.5°; 5 unequal spirals anterior spiral largest; strongly convex, posterior whorl slope slightly longer than anterior. Reklaw formation, Texas.—[Plummer, 1933].

In the Lisbon, Ala. material the writer noted a *Turritella* which is closely related to *T. mortoni.* It was gratifying to find that Prof. Harris had early called attention to this form and suggested the same relation.

F. B. Plummer named a new *Turritella* from the Reklaw of Texas. From the brief tabulation and figure of the species the form appears to be the same as that from Lisbon, Ala. The Lisbon variety is figured herein and further details of description are added, based on the Lisbon specimens. The two may prove to be distinct.

On the early apical whorls there are five, equal, spiral ribs with a fine, intermediate thread. On later whorls the basal, spiral rib increases in strength. Although the five, primary ribs predominate in size with maturity, they are triangular in size. Intermediate secondary, irregular spiral striations occur.

The shape of this variety is typical of *T. mortoni* (plate 23, figs. 6, 11; plate 24, fig. 13) in the excavation of the sutural area and the short, abrupt slope just above the suture. It differs from *T. mortoni* in having the greater number of equal, spiral ribs on the early whorls.

The specimens which are figured herein represent greater maturity than those figured by Plummer.

Syntypes.—Bureau of Economic Geology, Austin, Texas.

Occurrence.—Lower Claiborne: Reklaw formation. Old copper prospect 4½ miles northeast of Harwood, Caldwell county, Texas. (Plummer, type); locality 734.

Turritella apita de Gregorio Plate 24, figs. 1, 3, 7, 10

Turritella carinata H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 96, pl. 1, fig. 10; H. C. Lea, 1848, p. 107; Meyer, 1887, Acad. Nat. Sci. Phila., Proc., vol. 39, p. 54, pl. III, figs. 1, 1a; Harris, 1895, p. 10; non *T. carinata* I. Lea, 1833.
Turritella apita de Gregorio, 1890, p. 123, pl. 11, figs. 8, 26, 27; Cossmann, 1893, p. 29; Harris, 1895, p. 82.

T. testâ turritâ, crassâ, transversè striatâ et carinatâ; anfractibus—, valdè convexis, carinatis medio; suturis parvis; aperturâ rotundâ, subeffusâ.

Shell turrited, thick, transversely striate and carinated; whorls—, very convex, carinated in the middle; sutures small; mouth round somewhat effuse.

Length— Breadth .2 of an inch.

Remarks.—There are three striæ and a carina on each whorl, but as I have but a single specimen, I cannot determine whether this is a constant character. The striæ are very small, and are arranged, one near each suture and one on the under side of the carina, near its vertex. The whorls, from the magnitude of the carina, resemble a double cone, truncated at both ends. My specimen is fractured at the apex, so that the length and number of whorls cannot be satisfactorily determined.—[H. C. Lea, 1841].

H. C. Lea proposed the name of *T. carinata* after the *carinata* of his father was supposed to be the same as *T. mortoni* Conrad. In the present use of rules the name *Turritella carinata* H. C. Lea is a homonym and cannot be used. De Gregorio therefore renamed H. C. Lea's species, *apita,* and figured the adult shell. The original figure of Lea's was that of the apical and upper middle whorls. Meyer made careful drawings of the apical whorls.

This is a satisfactory species of *Turritella* to identify for it does not, as most Turritellas do in their life history, vary extremely in sculpture from the apical to adult whorls.

The species occurs associated with the common *T. carinata* Isaac Lea in the Gosport sand at Claiborne Bluff. The species is not abundant.

The species belongs to a bi-unicarinate series. The first three or four whorls of the spire have two strong, spiral ribs, the lowermost slightly smaller in size. The first carination occurs about on the midline of the shell, with the second rib below, nearer the suture. The interspaces on the shell are smooth. With further growth of the shell, the mid-spiral rib becomes decidedly stronger and the whorls thereafter are unicarinate. Accompanying an increase in size of the middle rib, two fine, spiral lines begin, one below the upper suture, the other just above the lower suture. The specimen which H. C. Lea figured and called *T. carinata* is a portion of the shell at this stage of the growth. The interspaces are still smooth. On about the ninth to eleventh whorl, fine, spiral threads begin below the middle carination between the secondary ribs. These increase in number and, on the adult shells several fine spiral lines occur on the lower portion of the whorls between the suture and secondary rib above.

The species probably belongs nearest to *T. hybrida* of Guillaume's groups.

Apical Angle.—16°.

Dimensions.—Height, 12 mm.; greatest diameter, 6 mm., lectotype.

Lectotype.—No. 13173, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Turritella arenicola branneri Harris Plate 23, figs. 1, 2

Turritella plebeia Owen, 1860, Sec. Ann. Rep. Geol. Recon. Ark., pl. 9, fig. 6.
Turritella carinata ? Heilprin, 1884, Cont. Geol. and Pal. p. 37.
Turritella carinata Call. 1889, Ann. Rep. Geol. Sur. Ark., vol. II, p. 8.
Turritella arenicola Dall, 1889. Call's Rept. footnote, p. 8.
Turritella arenicola branneri Harris, 1894, Ann. Rept. Geol. Sur. Ark., for 1892. vol. 11, p. 169, pl. VI, fig. 7.

This species differs from the true *arenicola* in having fewer revolving lines, less rounded whorls, and in being of considerably smaller size.

Localities:

White Bluff, Arkansas River.
Station 2231, 2413 and 2423, Rison.
2420, Cross Roads Church, 5 miles northwest of Kingsland.
2403, three quarters of a mile above Vince Bluff, Saline River.
2404, Hammaker's well, 12S., 9 W., section 8.
2408, Wadsworth's well, Long Prairie, Drew county.—[Harris, 1894].

In the description of the early shell history of this variety, that of the species is included as well. The nepionic whorls have the same characters.

The nepionic whorls are decidedly unicarinate. On some specimens the carina is extremely sharp. The carina is situated medially. Above the rib, the surface is smooth; below the carina there occurs a secondary, spiral rib. The size of the secondary rib varies. On the medial whorls traces of spiral ribs gradually develop between the carina and the suture above. Three ribs develop above the carina, and the rib below the carina increases in size correspondingly as the original carina decreases in size. Thus on medium-sized shells five spiral ribs occur on the lower whorls of the spire. With increased age further spiral ribs are added until, on specimens of old age, there are seven or eight, spiral ribs. Traces of microscopic, spiral lines occur between the primary ribs. The two, lowermost spiral ribs on adults are more pronounced in some cases. Specimens at various Jackson localities, have the two, lowermost ribs decidedly sharper and larger than the remaining ribs.

The species was described from the possible Claiborne of White Bluff, Arkansas River and several localities at Rison, Cleveland County, Arkansas. The species however occurs in the Jackson Eocene of Arkansas and in abundance at various Jackson Eocene localities in Louisiana.

Conrad[318] described the species *arenicola* as *M.* ? (*Mesalia*) *arenicola* from Enterprise. The error of locality was corrected by Aldrich[319] to Garland's Cr., Miss., Jackson Eocene. A further error as to locality must have been made by Conrad for in his checklist of 1866, he refers the species to Oregon, "Or".

Apical Angle.—18°.

Holotype.—No. 135141, United States National Museum, Washington, D. C.

Occurrence.—Claibornian or lower Jacksonian White Bluff.

Turritella dutexata Harris Plate 26, figs. 1-4, 8, 9

Turritella dutexata Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 82, pl. 9, fig. 8.

Whorls (in a complete specimen) about 15; all marked by two subcentral carinal lines together with one small one just below and one just above the suture.

Besides the ornamentation shown on the specimen figured there are usually about four spiral striæ on each whorl between the upper carinal and subsutural line; between the two strong carinal lines there is often a faint stria; likewise one often appears just below the lower carina. When fully striated this species bears a general resemblance to *T. arenicola* and *T. arenicola* var. *branneri,* but may be distinguished at once by the persistency of the bicarinate feature of the whorls to the very apex. The apical whorls of *T. arenicola* and variety are unicarinate somewhat as in *T. carinata* H. C. Lea (*T. apita* De Greg.). It will be observed that in Meyer's carefully drawn figure of *T. carinata* H. C. Lea, in the Proc. Ac. Nat. Sci. Phila., 1887, p. 54, pl. 3, fig. 1, 1a, two carinæ are represented on each whorl, but it is the upper one which predominates on the apical whorls; in *dutexata* it is the lower.

Localities.—Elm Creek, Lee Co.; Taylor's well, 5 miles southeast of Franklin, Robertson Co. (specimens in the U. S. Nat. Mus.) ; 7 miles southeast of Jewett, Leon Co., (specimens in Aldrich's coll.) ;also in a small varietal form at Orrell's Crossing, Elm Creek, Lee Co.; near Baptizing Creek, Cherokee Co., Tex. Also in Louisiana at southwest ¼, southeast ¼ Sect. 19, R. 7W, Tp. 19; Holstein's well, 5 miles south of Gibbsland, Bienville Parish; mouth of Saline Bayou, Red River; Sect. 19, Tp. 17, R. 5W.

[318]Conrad, T. A., Amer. Jour. Conch., vol. I, p. 141, pl. 10, fig. 11, 1865.
[319]Aldrich, T. H., Amer. Jour. Sci., 3d. ser. vol. XXX, p. 307, 1885.

In Mississippi 2½ miles east of Newton; Wautubbee hill, near Enterprise. In Alabama at Claiborne.

Geological horizon.—Lower and Upper Claiborne Eocene.

Type.—Singley's collection.—[Harris, 1895].

The nepionic whorls have three, obscure, spiral ribs, the uppermost of which is beaded. From the fourth or fifth whorl, the medial and submedial ribs become stronger and the upper rib decreases in size. The shell becomes typically bicarinate. The spiral ribs are irregularly and obscurely beaded. At some localities the beaded character of the ribs is more strongly developed. Small, spiral cords gradually develop just above the lower suture and just below the upper suture. Fine, spiral striations develop between the larger carinations and on the upper portions of the whorl. They occur irregularly in position and in size. They may occur over the whole of the whorl or just between the larger ribs.

On large, mature specimens four spiral ribs of secondary size occur between the suture and the first carina. A secondary rib may occur between the carinæ as well as below the second carina and the lower suture. The increase in size of the secondary ribs slightly obscures the bicarination of the adult whorls. The distinct feature of the species is, as Prof. Harris pointed out, the persistence of the bicarination. Otherwise the species may be easily confused with *T. arenicola branneri.* The growth of the bicarination persists from the apical whorls late into maturity. There is a suggestion from the character of the largest specimens of the species at Lisbon, Ala., that the typical bicarination does not persist in all cases of old age. Fragments of large individuals 14 mm. in diameter, have the medial rib increased in size, approaching a unicarinate condition.

The growth lines appear to belong to the *T. hybrida* group.

This species is characteristic of the Claibornian localities below the Gosport sand. A single specimen (figured pl. 26, fig. 1) has been found by the writer in the Gosport sand.

Dimensions.—Apical angle 15°—20°.

Holotype.—Formerly in the Singley collection, Department of Geology, University of Texas, Austin, Texas. Probably lost.

Occurrence.—Lower Claiborne: localities 103, 707, 708, 724, 725, 728, 730, 731, 732, 734, 746, 756 and 765. Gosport sand: locality 104.

Turritella nasuta Gabb Plate 25, figs. 1, 2, 3, 5, 6, 8-10; Plate 83, fig. 5

Turritella nasuta Gabb, 1860, Acad. Nat. Sci. Phila., Proc., 2d. ser., vol. IV, p. 385, pl. 67, fig. 42; Conrad, 1865, p. 32; Conrad, 1866, p. 11; de Gregorio, 1890, p. 124; Heilprin, 1891, p. 400; Stenzel, 1931, Univ. Texas Bull. No. 3101, pl. VI, fig. 15; Plummer, 1933, Univ. Texas Bull. No. 3232, p. 815, pl. X, figs. 12, 12a.

Shell elongated, slender; whorls many (number? eleven in one inch); mouth small, suture distinct; surface marked by eight revolving lines, two or three of which are larger than the rest.

Dimensions of a specimen one inch long.—Width of body whorl .2 in., length of mouth .15 in.

All the specimens I have seen are broken and nearly all worn smooth. It is common.

Locality.—Caldwell Co., Texas, and Wheelock.—[Gabb, 1860].

The species was described by Gabb from "Caldwell Co. and Wheelock, Texas". The description and figure are ambiguous for a *Turritella*. "Surface marked by eight revolving lines," depends upon what portion of the spire one is examining. In this case there are in general eight lines on the lower whorls of the spire on adult shells. The type is a complete specimen showing the adult sculpture. The species is "slender" but in its abundant distribution there are some localities at which the shells are noticeably slenderer than elsewhere. The type shell is not so slender as some of the specimens from two localities,—Smithville, Texas, and base of the bluff at Claiborne, Ala.

The species belongs to the tricarinate series of Turritellas, more strictly speaking bicarinate-tricarinate. The nepionic whorls are bicarinate with the suggestion of a third carination, but the ornamentation rapidly becomes tricarinate and is the conspicuous character of the apical whorls. The uppermost rib of the three is smaller at first and gradually becomes of equal size on the middle whorls of the spire. At the same time as the increase in size of the first spiral rib, there is the setting in of fine, intermediate, spiral lines, which also increase gradually in size with the growth of the shell. The *increase* in size of the finer lines, is accompanied by a *decrease* in size of the original, heavy ribs so that on the adult whorls there are from six to nine and more with an average of eight (as Gabb designated on his shell) fine, spiral ribs, irregular in size. The variation in the shells which gives them a slightly different appearance is the development of the ribs on the last whorls; whether they are evenly developed as to size; whether they are irregular in size with the initiation of a third series of fine, spiral lines or whether the lower, original, carinate lines remain slightly stronger than the rest of the ribs. Specimens occur which grade from one condition to the other.

The spiral growth lines of the species seem to belong to Guillaume's[320] "group of T. hybrida".

The apical angle of the type of the species is 11.5°. The apical angle of specimens in variations of the species range from 10° to 15°. Because of the great variation and abundance of *T. nasuta* Gabb the species needs a special careful study to determine the constancy of the changes. Some of the variations noted are figured herein. Time does not allow a more thorough study.

Dimensions.—Apical angle 11.5°; height, 25 mm.; greatest diameter, 6 mm. (type).

Type.—No. 13293, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: "Caldwell Co. and Wheelock, Texas" (Gabb); localities 103, 707, 708, 723, 725, 727, 730, 734, 741, 743, 747, 756, 757, 758, 765, 766, 778 and 803. Gosport sand: locality 104.

Turritella nasuta houstonia Harris Plate 25, figs. 4, 7, 11

Turritella nasuta houstonia Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 81, pl. 9, fig. 6; ? Plummer, 1933, Univ. Texas Bull. No. 3232, p. 815, pl. 10, fig. 12.

This variety differs from typical *nasuta* in being much broader at base, and having its whorls rounded or slightly carinated submedially. It is generally somewhat larger than the typical form, and is closely related to Conrad's *Mesalia lintea.*

Localities.—Rio Grande, at Webb-Zapata County line; Elm Creek, near Benchley; Alum Bluff Trinity River, Houston Co.; Dunn Ranch, Robertson Co. Also in South Carolina, near Orangeburg, C. H.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The original figure of *houstonia* shows four prominent, spiral ribs with wide interspaces. Specimens at Moseley's Ferry duplicate such sculpture. The posterior, spiral rib decreases in strength posteriorly until on the early, apical whorls there are only three prominent spiral ribs.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 723.

[320] Guillaume, Louis, 1924, p. 285.

Turritella dumblei Harris Plate 26, figs. 10, 11, 15

Turritella dumblei Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 81, pl. 9, fig. 7.

Size and general form as shown by the figure; whorls about 15; the lower two to four show an obtuse basal carination while above, this feature is not so apparent; surface marked by raised spiral lines alternating in size, the carinal zones of the lower whorls are marked by two somewhat stronger lines; lines of growtn plainly cutting the spiral lines and causing them to appear under a glass like diminutive strings of beads.

This species reminds one somewhat of *T. alabamiensis* Whitf., but is most probably nearest allied to *T. infragranulata* Gabb (Geol. Surv. Cal., Pal., vol. 1, 1864, p. 212, pl. 32, fig. 279), from near Martinez, Cal. Wherever the lines of growth are strong over the basal carina they tend to produce an ''*infra-granulata*'' appearance.

Localities.—Mosley's Ferry, Brazos River, Burleson Co.; Cedar Creek, Wheelock League; well at College Sta., Brazos Co.; Campbell Creek, Robertson Co.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The only available specimens for study of this species were three loaned from the University of Texas. The specimens were from the original Harris collection, Geol. Sur. Texas and identified by Harris. One specimen shows apical whorls but does not contain the first whorl. There are three, strong, spiral ribs equally spaced, the lowermost just above the suture. The nearness of the basal rib to the suture gives the whorl a rolled or abrupt carination just above the suture. Intermediate, finer lines occur between the primary ribs. The spiral ribbing is more pronounced on the specimens examined than is indicated on the figure of the type.

Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas. Probably lost.

Turritella clevelandia Harris Plate 26, figs. 6, 7

Turritella clevelandia Harris, 1894, Ann. Rept. Geol. Sur. Ark., for 1892, vol. II, p. 170, pl. VI, fig. 9; var. Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 74, pl. 10, fig. 2.

? *Turritella perdita* Dall, 1889, Ann. Rep. Geol. Sur. Ark., vol. II, p. 8.

? *Turritella mortoni* Call, 1889, Ann. Rep. Geol. Sur. Ark., vol. 11, p. 8.

Size and general form as indicated by the figure; whorls 13 or 14; generally ornamented by about three prominent revolving lines and a few subordinate ones; from the uppermost and lowest of the revolving lines the whorls slope abruptly to the suture, while between these lines the sides of the whorls are straight.

Localities:

White Bluff, Arkansas River.
Rison.
Toledo, Orton Place.
Above Vince Bluff, Saline River.—[Harris, 1894].

The writer does not have access to a suite of specimens of this species so as to describe the shell history of the individual or determine the salient characters.

Prof. Harris stated in 1899, that the type was from the Jackson beds of Arkansas. He placed the Sabine forms with hesitation under *clevelandia.* The Sabine shells have the same shape of the whorls as *clevelandia.* The Sabine form is abundant at Wood's Bluff, Ala. When a corresponding set of the Jackson is found the specific relationship of the two may be determined. The Harris collection contains a single specimen from the ? Jackson of White Bluff, Ark.

Holotype.—No. 135142, United States National Museum, Washington, D. C.

Turritella femina Stenzel in Plummer Plate 26, fig. 5

Turritella femina Stenzel, 1931, Univ. Texas Bull. No. 3101, p. 87 [reference only], pl. VI, fig. 14; Plummer, 1933, Univ. Texas Bull. No. 3232, p. 815.

Apical angle 13°; 7 fine spirals of equal size; gently convex; fine growth lines prominent between spirals. Weches formation, Texas.—[Plummer, 1933].

This species did not become valid until 1933 when Plummer included, in an identification table of Eocene Turritellas, the notes given herein.

Turritella obruta Conrad Plate 26, figs. 12-14; Plate 82, fig. 11

Turritella obruta Conrad, 1833, Nov., p. 45; Conrad, 1835, p. 40, pl. 15, fig. 12; Conrad, 1834, App. in Morton, p. 4; H. C. Lea, 1848, p. 107; d'Orbigny, 1850, p. 342; Harris, 1895, p. 31; Stewart, 1826, Acad. Nat. Sci. Phila., Proc., vol. 78, p. 350 [misspelled *abrupta*] non *T. obruta* Locard=*T. Locardi* Cossmann.

Turritella lineata Lea, 1833, Dec., p. 130, pl. 4, fig. 121.

Mesalia obruta Conrad, 1865, p. 33; Conrad, 1866, p. 11; Heilprin, 1891, p. 400 [subgenus *Turritella*]; Cossmann, 1893, p. 30; Clark, 1901, Md. Geol. Sur., Eoc., p. 149, pl. XXVII, fig. 4; Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 127.

Turritella vittata var. *abruta* de Gregorio, 1890, p. 124, pl. 11, figs. 11, 25, [error in spelling].

Subulate, with about eleven slightly convex volutions, with about seven sharp elevated striæ on each, and intermediate fine crowded lines; space about the suture indented.—[Conrad, 1833].

Whorls 11, slightly convex, with about 7 sharp elevated striæ on each and intermediate fine close set lines; area of the suture indented; aperture subovate.

Syn. T. lineata, *Lea, Con. p.* 130, *pl.* 4, *f.* 121.

Locality.—Claiborne, Alab.—[Conrad, 1835].

There is a tendency to misspell the specific name. It is probably this species which Plummer[321] had in mind when he spelled the name *abrupta*. Plummer's comes from the Sequin formation, lower Sabine (Wilcox) Eocene of Texas.

The earliest whorls available in the collection are about the third or fourth. On those whorls there are three large, equally spaced spiral ribs, the first not as well developed as the other two. There are faint, intermediate, spiral striæ. On the following whorls there is an increase in size of the intermediate striæ until within the development of two or three whorls they are equal in size to the primary ribs and the sculpture thereafter consists of about seven (as described by Conrad) conspicuous, spiral ribs. The interspaces between the ribs have fine striations. Frequently the three lower, primary ribs may be slightly larger in size and stand out from the remaining ribs. The lower part of the body whorl lacks the larger ribs and is ornamented by spiral, microscopic striations only.

De Gregorio was misled in his comparisons of "Potamides" *alabamiensis* Whitfield,[322] from the Sabine Eocene and assigned the latter in synonymy. Whitfield's species is a *Mesalia*. It has fewer, strong, spiral ribs over the whorls. The chief distinction between the two forms is the continuation of the spiral ribs over the base of the body whorl in *Mesalia alabamiensis*, whereas in *T. obruta* the area is smooth except for faint lines. De Gregorio compared *T. obruta* with *Mesalia vittata* Lamarck var. d Deshayes[323] of the Paris Basin. The French species is somewhat like *M. alabamiensis* and the sculpture differs from *obruta* in the same respect to the heavier, spiral ribs extending over the basal portion of the body whorl.

Some individuals show a variation in that the primary ribs are finer and the intermediate striations are more conspicuous.

The species has a stout shape which suggests *Mesalia* affinities.

Dimensions.—Apical angle 15°—20°. Height, 30 mm.; greatest diameter, 11 mm., lectotype *T. obruta* Conrad; height, 23 mm.; greatest diameter, 8 mm., lectotype *T. lineata* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; lectotype *T. lineata* Lea, No. 5668, A.N.S.

[321]Plummer, F. B., Univ. Texas Bull. No. 3232, p. 815, pl. X, fig. 6, 1933.
[322]Whitfield, R. P., Amer. Jour. Conch., vol. 1, p. 266, pl, 27, fig. 13, 1865.
[323]Deshayes, G. F., Desc, Coq. Fos. env. Paris, pl. 38, figs. 13, 14, 1837.

Occurrence.—Lower Claiborne: locality 731. Gosport sand: locality 104 (type).

The following Turritellas which have not been noted as yet in this report were described by De Gregorio, supposedly from Claiborne, Alabama.

T. miroplita de Gregorio, 1890, p. 123, pl. XI, fig. 10 is not a *Turritella*. See *Clava vinctum* (Whitfield).

T. vittata miga de Gregorio, 1890, p. 124, pl. XI, fig. 16. The only specimen figured is a single whorl.

T. propeperdita de Grègorio, 1890, p. 125, pl. XI, fig. 21. If this specimen came from Claiborne it is probably *T. obruta* or related to it.

T. mela de Gregorio, 1890, p. 127, pl. XI, fig. 40; Cossmann, 1893, p. 29. The figure of the form suggests *T. nasuta* Gabb.

The types of these forms are in the De Gregorio home, Via Molo 132, Palermo, Sicily.

Genus MESALIA Gray, 1842.[323a]

Genotype by subsequent designation, Gray, 1847,[324] *Cerithium Mesal Adanson*=*Turritella brevialis* Lamarck *Mesalia brevialis* (Lam.)[325]. Living. Northern and Western Africa.

Mesalia vetusta (Conrad) Plate 27, figs. 7, 8, 13-15

Melania ? vetusta Conrad, Sept. 1833, p. 35; H. C. Lea,, 1848, p. 101.
Cerithium ? striatum Lea, 1833, Dec., p. 131, pl. 4, fig. 122.
Proto vetusta Conrad, 1834, Acad. Nat. Sci. Phila., Jour., vol. VII, p. 146; Conrad, 1834, App. in Morton, p. 4; Dall, 1892, p. 308.
Turritella vetusta Conrad, 1835, p. 40, pl. 15, fig. 12.
Mesalia venusta Conrad, 1865, p. 33 [error in spelling]; Conrad, 1866, p. 11; ? Heilprin, 1891, p. 400; Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 127.
Mesalia striata (Lea) Conrad, 1865, p. 33; Conrad, 1866, p. 11.
Cerithium (*Cerithidea*) *vetustum* (Conrad) de Gregorio, 1890, p. 117, pl. 10, figs. 18-21.
Mesalia vetusta (Conrad) Cossmann, 1893, p. 29; Harris, 1895, pp. 48, 50, pl. 1, fig. 6, non Aldrich, 1886, Bull. Geol. Sur. Ala., No. 1, pp. 46, 56.

Shell turrited, acute, with numerous revolving, slightly elevated lines, alternately larger and smaller, and longitudinal minute, much arcuated wrinkles; suture obvious, not deeply impressed; canal patulous; aperture about one-fourth of the length. Length 1¼ inches.

This seemingly fresh water shell occurs with the marine testacea in the arenaceous strata near Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

[323a]Gray, J. E., Synop. Cont. Brit. Mus. 44 ed., p. 61, 1842; see Iredale, T., Mal. Soc. Lond., Proc., vol. 10, p. 306, 1913. There is a question whether the name should date from 1842 or 1847.

[324]Gray, J. E., 1847, p. 155.

[325]Smith, E. A., Ann. Mag. Nat. Hist., vol. XV, 8th ser., p. 367, 1915.

Turrited, with spiral raised lines alternated in size, and longitudinal much arcuated wrinkles; whorls angulated at the summit; aperture obliquely elliptical, effuse; labrum extremely thin; labium somewhat folded, and slightly reflected at base,

Cerithium? striatum, Lea. Con. p. 131, pl. 4, f. 122.

Very numerous but so rarely perfect that its generic character has hitherto been mistaken. I referred *Melania* ? in No. 3, first ed. Its aperture resembles that of *T. melanoides* Lam.—[Conrad, 1835].

Post-nuclear whorls spirally striate, the longitudinal wrinkles when present do not seem to begin until after the third or later whorls. The amount of the longitudinal folding is an individual character. The shell of medium size has the most folding and the wrinkles usually occur conspicuously over the upper and middle whorls of the spire. Some specimens however show the character only faintly. The longitudinal folds become obsolete with age and the largest specimens have only faint traces or lack them entirely. Some may retain them in old age. The shell is variable in its shape. Some are conspicuously plumper for the same height than others. When one has the mass of specimens of a species available as there is for this species, the differences are seen to be only individualistic, gradational and not worthy of extra names.

The twist in the columella is prominent. So far as the characters of this fossil are shown the species seems to be typical *Mesalia*.

Whether through error or intentionally Conrad in his checklist of 1865 started the change of the *t* in the specific name to *n*. Such interchange has been repeated quite often in literature.

Mesalia vetusta is the most abundant species in the Harris collection of the Gosport sand. There are hundreds of specimens. The shell must have been fragile for one finds a large number of specimens which have been injured before maturity. The growth of the shell was continued but the line of the spire became curved or one part of the shell set obliquely to the other.

The references to this species in the lower Claiborne probably should be taken as *M. claibornensis* Harris. Prof. Harris brought out the differences between the two species in his description of *claibornensis*.

This species, which is so abundant and characteristic, has been poorly illustrated. Lea's figure of the species is much better than that of Conrad. De Gregorio gave the best figures of a suite of specimens. The fine, spiral and longitudinal lines are difficult to portray accurately by drawing.

Dimensions.—Height, 32 mm., greatest diameter, 11 mm., lectotype; height, 31 mm., greatest diameter, 11 mm., lectotype *Cerithium striatum* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5670 A. N. S., lectotype *Cerithium striatum* Lea.

Occurrence.—Gosport sand: locality 104.

Mesalia claibornensis Harris Plate 27, figs. 9, 10, 16

Mesalia claibornensis Conrad (MS); Heilprin, 1891, p. 400; Harris, 1895, Acad. Nat. Sci. Phila., vol. 47, p. 80, pl. 9, fig. 5.

Size and general form as indicated by the figure; whorls about 15; sides of the whorls nearly rectilinear; sides of the spire taken as a whole slightly concave; surface of each whorl ornamented by spiral lines of three sizes, of which there are from five to seven of the first and second, and double that number of the third magnitude, the latter are mere striæ; lines of growth faint or obscure; suture well defined but very narrow.

This species is similar in some respects to Conrad's *Mesalia vetusta*, but can at once be distinguished by the following differences: *claibornensis* has two or three more whorls; the sides of the spires are concave and not convex as in that of *vetusta;* the suture is less distinctly marked by a shoulder below it; there is a total lack of those strong lines or folds of growth so characteristic of *vetusta;* the lower angulation of the body whorl is more sharply defined.

Localities.—Colorado River, Devil's Eye, Bastrop Co.; Mosley's Ferry, Brazos River; Wheelock, Robertson Co.; Little Brazos River; Cedar Creek, Wheelock League, Walker's and Montgomery's farm, Robertson Co.; College Sta.; Brazos Co. (from a well 1,200 feet deep); Elm Creek, near Benchley's; Wm. Reid Headright, Brazos Co.; Elm Creek, Lee Co.; Berryman's Place, Cherokee Co.; Alabama Bluff, Trinity River, Houston Co.; 5 miles west of Crockett, and Hurricane Bayou, Houston Co.; northwest corner of Madison Co.; 3 miles northeast of Crockett, on Rusk road; along Elm Creek, from Orrell's to Price's crossing; Lewis' house, 2 miles east of Alto, Cherokee Co.; Dr. Collard's farm, Town Branch, Sparks Headright, Brazos Co.; Dunn's Ranch, Gafford Headright, Robertson Co.; Walker's pasture, Wheelock Prairie, Robertson Co.; Bonita Creek, Pleasanton, Atascosa Co., Tex. Also 5 miles southeast of Gibbsland, and 2 miles southeast of Mt. Lebanon, Bienville Parish, La.; 4 miles west of Enterprise, Miss.; base of bluff at Claiborne, Ala.

Specimens from the last-mentioned locality are somewhat less broad at base, more strongly striated spirally, and with slightly more rounded volutions than the typical Texan form. In the collection of the Academy of Natural Sciences of Philadelphia these Lower Claiborne forms are labelled by Conrad "*Mesalia claibornensis*". I am not aware that the species has ever before been figured or described. It is one of the most abundant and characteristic of the Texan Eocene.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

This species is widely distributed and abundant in the lower Claiborne of Texas. It occurs in Louisiana, Mississippi and the base of the bluff at Claiborne, Alabama.

Harris used Conrad's museum label name "*Mesalia claibornensis*" which is on a specimen in the Academy of Natural Sciences at Philadelphia from Claiborne, Alabama. Prof. Harris chose a Texas shell as the type of the species, for he lists the type in the Texas State Museum. Pepresentatives are figured herein from Alabama. The original description brings out the differences between the shells from the eastern and western parts of the embayment.

The twist of the columella, flare of the callus and broad anterior sinus show the species to be a *Mesalia.*

Dimensions.—Height, 33 mm., greatest diameter, 11 mm.; height, 25 mm.; greatest diameter, 10 mm. Conrad specimen, (broken).

Holotype.—Geological Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 103, 730, 734 and 766.

Mesalia pleboides Vaughan Plate 27, figs. 5, 11, 12

Mesalia pleboides Vaughan, 1896, U. S. Geol. Sur., Bull. 142, p. 36, pl. III, figs. 4, 5. 6.

Size and form indicated by figures. Whorls convex, with a deeply impressed suture, 1-5 smooth. Surface of remaining whorls covered with many revolving, rather coarse, striæ, finer ones often being between the coarser. On the median portion of the fifth to the ninth whorls two of the revolving lines are stronger than the others, giving these whorls a subcarinate appearance. The lower of these striæ may be decidedly more prominent, thus producing a rather decided carination.

This species bears considerable resemblance to the Miocene *Turritella plebia*, but is smaller, and has not such coarse striæ. The older whorls of the Miocene species in the old forms show indications of loose coiling. I have not seen such in *T. pleboides.*

Localities.—Hammetts Branch, near Mount Lebanon (types Vaughan) wells, sec. 17, T. 18, R. 6 W.; Holstun's place, sec. 17, T. 18, R. 6 W.; and Holstun's well; all in Bienville Parish (L. C. Johnson).

Geological horizon.—Lower Claiborne.

Types in United States National Museum.—[Vaughan, 1896].

The sculpture begins with a bicarinate condition on the sixth whorl where transverse ribs appear. The superior carina on the early whorls suggests an unequal tri-carination of the whorl. There is a slight fold on the columella.

Dimensions.—Height, 22 mm.; greatest diameter, 8 mm., syntype.

Syntypes.—No. 140740, United States National Museum.

Occurrence.—Lower Claiborne: localities 730 and 771.

Mesalia lintea Conrad is a nomen nudum. Conrad listed the species in 1865 and 1866 but the form was never described or figured. The holotype is in the Academy of Natural Sciences at Philadelphia. The form is a variety of *N. nasuta* Gabb. Prof. Harris[326] referred to the shell in his notes of *T. nasuta houstonia.*

Family VERMETIDÆ[327]

Genus LEMINTINA Risso, 1826[328]

(*Serpulorbis* Sasso, 1827.)

Genotype by monotypy *Lemintina cuvieri* Risso (=*Serpula arenaria Linné*).[329] Living. Mediterranean.

Lemintina ornata (Lea) Plate 28, figs. 9, 13, 14

Serpula ornata Lea, 1833, p. 37, pl. 1, fig. 5; Conrad, 1834, App. in Morton, p. 8; H. C. Lea, 1848, p. 105; Conrad, 1866, p. 20; non *S. ornata* Sowerby in Dixon, 1850, Geology Sussex, p. 206.

Serpula squamulosa Conrad, 1834, Acad. Nat. Sci., Phila., Jour. VII, p. 149; Conrad, 1834, App. in Morton, p. 8; H. C. Lea, 1848, p. 105; Conrad, 1866, p. 20.

Anguinella ornata Conrad, 1846, Amer. Jour. Sci., 2d. ser., vol. 1, p. 212, pl. 1, fig. 4.

Serpulorbis ornatus (Lea) de Gregorio, 1890, p. 120, pl. 10, figs. 34-38; Dall, 1892, p. 306.

Vermetus ornatus (Lea) Cossmann, 1893, p. 30.

Lemintina ornatus (Lea) Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 139.

Shell granulate, below furnished with three squamose carinæ.

Observation.—Having a single specimen only of this species, it is difficult to decide on its characteristics. The beautiful granulations which cover the superior part, and the squamose carinæ will, I presume, be usually if not always found to exist on it. The form, however, of different individuals will most likely differ. The one above described takes one turn to the right, then three to the left, forming a disk, the inferior portion being widely umbilicated. It has some resemblance to the *granulata* (Sowerby), but differs in having carinæ.—[Lea, 1833].

The specimens are found as small fragments or as a mass of tightly twisted tubes. The tubes contain convex (to the apex) septa of the character such as those of *Tenagodes vitis* (Conrad). This character is typical of the genus *Lemintina* as seen on *Serpula arenaria,* the type species.

Cossmann[330] stated that Conrad proposed "(1863) *Anguillina*

[326]Harris, G. D., Acad. Nat. Sci. Phila., Proc. vol. 47, p. 81, 1895.

[327]Mörch, O. A. L., Review of the Vermetidæ, Proc. Zool Soc. Lond., p. 400, 1860; ibid, p. 145, 1861; ibid, p. 54, 1862; Tryon, G., Man. Conch., vol. VIII, p. 163, 1886; Cossmann, M., Essais Pal. Comp. 9 liv., p. 138, 1912; Woodring, W. P., 1928, p. 345.

[328]Risso, A., 1826, p. 114; see Woodring, W. P., 1928, p. 345 *Tulaxodus* "*Thylacodes*" Guettard, 1774 may be the name to use.

[329]Bucquoy, E., Dautzenberg, Ph. and Dollfus, G. F., 1884, vol. 1, p. 236.

[330]Cossmann, M., Essais Pal. Comp., 9 liv., p. 146, 1912.

(*nomen nudum*) pour *Serpula virginica* Conrad." Cossmann misspelled the generic name and gave the date incorrectly.

Conrad proposed *Anguinella* in 1845[331] with a monotype *A.* 103, 1893].
virginiana Conrad. The species was originally spelled *virginica.*[332]

In 1846, Conrad, placed *L. ornata* in *Anguinella* but the species is not related to *A. virginica* Conrad.

Dimension.—Diameter, 5 mm.

Holotype.—Not found.

Occurrence.—Lower Claiborne: localities 136 and 731. Gosport sand: locality 104 (type).

Lemintina major Chavan, new species Plate 28, figs. 1, 6

Vermetus major Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 139 nomen nudum under *Lemintina.*

Cette espèce correspond à un seul echantillon de la collection Cossmann (No. 5176), provenant de Claiborne (Gosport) et mesurant 40X22 mm. Bien qu'etiqueté ''type figuré,'' je n'ai pu, nulle part, trouver de description de l'espèce, seulement mentionnée dans les ' Essais de Paléoconchologie comparée'', (IX, p. 139, 1912), parmi les *Lemintina.*

L'echantillon étant unique, je n'ai pu le sacrifier pour y faire des coupes et vérifier, d'après les caractères internes, l'attribution sous générique. Mais la forme générale me parait bien correspondre à un *Lemintina.*

Caractères: C'est un tube peletonné et contourné, de section 7 à 8 mm., qui était fixé par sa face inférieure sur une coquille. Il est orné d'assez nombreuses côtes longitudinales granuleuses, séparées par d'autres plus fines, et decoupées de nombreuses stries d'accroissement.

Rafforts et differences: E'est la une ornementation très comparable à celle d'especès miocenès telles que *V. arenarius, L.* de Touraine *V. ornatus Lea,* de Claiborne, est beaucoup plus petit, et est orné de carènes qui donnent une ornementation bien différente de celle de *V. major.*

The author takes pleasure in including the description and figures by M. André Chavan of "*Vermetus major*" Cossmann which was mentioned by Cossmann but never described.

Holotype.—No. 5176, Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Genus **TENAGODUS** Guettard, 1770.[333]

(*Siliquaria* Lamarck, 1799.)

Genotype *Serpula anguina* Linné. Living. Indo-Pacific.

331Conrad, T. A., Fos. Med. Tert., No. 3, p. 177, 1845 [Reprint Dall, p.
332Conrad, T. A., l. c., No. I, back, 1839.
333Guettard, J. Et., 1770, vol. 3, p. 128 fide Sherborn. 1774 usually given by authors.

Tenagodus vitis (Conrad) Plate 28, figs. 7, 10, 12, 15-17

Siliquaria vitis Conrad, 1833, Sept., p. 36; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 47; Conrad, 1846, Amer. Jour. Sci., 2d. ser., vol. 1, No. 2, p. 211, pl. 1, fig. 1; H. C. Lea, 1848 p. 105; d'Orbigny, 1850, p. 350; Dall, 1892, p. 307; Dall, 1915, U. S. Nat. Mus., Bull. 90, p. 97.

Siliquaria claibornensis Lea, 1833, Nov., p. 33, pl. 1, fig. 1; Meyer and Aldrich, 1866, Cincinnati Soc. Nat. Hist., vol. 9, p. 48.

Tenagodus vitis (Conrad) Mörch, 1860, Zool. Soc. Lond., Proc., p. 415.

Tenagodus claibornensis (Lea) Mörch, 1860, ibid, p. 413.

Tenagoda vitis Conrad, 1865, p. 33; Conrad, 1866, p. 11; de Gregorio, 1890, p. 121, pl. 10, figs. 40-45; pl. 11, figs. 1, 2 and variety *plita;* Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 148.

Tenagodes plitus (de Gregorio) Cossmann, 1893, p. 30; Cossmann, 1912, l. c., p. 150 subgenus *Pyxipoma.*

Tenagodes claibornensis (Lea) Cossmann, 1893, p. 30; Cossmann, 1912, l. c., p. 148.

Shell irregularly spiral towards the top, with slightly elevated longitudinal lines; fissure narrow. Greatest diameter ¼ of an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Contorted, with longitudinal ribs becoming obsolete inferiorly; wrinkled transversely; fissure inarticulate.

Syn. S. claibornensis, *Lea, Con. p.* 33, *pl.* 1, *f.* 1.

Locality.—Claiborne, Alab.

This shell is common at Claiborne, where I have seen it twelve inches or more in length near the base of the arenaceous stratum, but it was too friable to be extracted entire. I have a pair twisted together, in the spiral portion, like two tendrils of a vine. This shell has numerous thin vaulted septa. No. 3, first ed. p. 36—[Conrad, 1835].

The two, distinctive characters which identify this form are the continuous slit and the loosely coiled shell. It is found in fragments of about 40 mm., in height. The collections studied do not have a complete specimen. Conrad stated he had seen specimens "twelve inches or more in length". One would not doubt such dimensions.

After carefully examining several hundred fragments the writer cannot reconcile De Gregorio's *plita* as being more than an individual variation of *T. vitis* and not worthy of varietal rank. Fragments entirely smooth can be found. Others have longitudinal ribs fairly well developed and innumerable specimens are partially ribbed and partially smoth. Some fragments show the ribs with an overlapping, lamellar character. The longitudinal ribs are most frequently on the apical twists. The original description states the ribs become obsolete inferiorly and the species is so figured.

The interior of the tube contains numerous, smooth, convex (to the apex) septa. The septa occur in the smooth and in the longitudinal, striated fragments.

The Claiborne species is nearest to *T. striata* (Defrance) of the Paris Basin Lutetian. The ornamentation and fissure are similar in the two species. Deshayes[334] figured the development of the shell with conspicuous, squamose ribs. Fragments have been found of *T. vitis* which show such a tendency in the American species.

Dimensions.—Diameter, 8 mm., (average of adult).

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 708, 724, 726, 728, 730 and 731. Gosport sand: locality 104 (type).

Subgenus **AGATHIRSES** Montfort, 1808.[335]

Genotype by original designation *Agathirses furcellas.* Montfort=*S. squamosa* Lam.[336] Eocene. France.

Tenagodes (Agathirses) texana, new species Plate 28, fig. 11

Medium in diameter; curved; surface coarsely sculptured with longitudinal, spinose ridges; there is a primary set of ridges with two or three, smaller, longitudinal, spinose ridges between; interspaces are wide; the longitudinal groove is present; spines on the holotype are worn.

This species is known from one fragment. The spiny sculpture is distinct and unique. Because it is different from the other Claibornian species of the Vermetidæ in any phase of their development, the species is described even though it may be incomplete.

The species is typical of *Agathirses* Montfort as represented by the type and several species[337] in the Eocene of the Paris Basin. The subgenus so far is known only from the Eocene.

Dimension.—Diameter, 3 mm.

Holotype.—No. 2940, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 727.

[334]Deshayes, G. P., 1861, Tome II, p. 292, pl. 10, figs. 7-14.
[335]Montfort, D., 1808, vol. 1, p. 399.
[336]Mörch, O. A. L., 1860 fide ; Cossmann, M., Essais Pal. Comp., 9 liv., p. 148, 1912 gives *Siliquaria spinosa* Lam. Eocene, France as genotype.
[337]Cossmann, M., Essais Pal. Comp., 9 liv., pl. 10, figs. 11-15, 1912; Cossmann, M. and Pissarro, G., 1910-13, Tome 2, pl. XXII, figs. 132-1-5.

Family TRICHOTROPIDÆ

Genus CERITHIODERMA, Conrad, 1860.[338]

(*Mesostoma* Deshayes, 1861.)

Genotype by monotypy *C. prima* Conrad. Eocene. United States.

Cerithioderma prima Conrad — Plate 28, figs. 2, 3

Cerithioderma prima Conrad, 1860, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. IV, p. 295, pl. 47, fig. 30; Conrad, 1866, p. 14; Tryon, 1883, vol. II, p. 247, pl. 69, fig. 51; Dall, 1889 Bull. Mus. Comp. Zool. 18, p. 269; de Gregorio; 1890, p. 118, under *Cerithium;* Dall, 1892, p. 293; Cossmann, 1893, p. 30; Cossmann, 1906, Essais Pal. Comp., 7 liv., p. 191, pl. IV. fig. 30 *primum*.

Mesostoma rugosa Heilprin, 1879, Acad. Nat. Sci. Phila., vol. 31, pp. 215, 225, pl. 13, fig. 13; Meyer, 1887, Bericht Senck. natur. Gesell. für 1886, p. 18; de Gregorio, 1890, p. 120.

Mesostoma lisbonensis Aldrich, MS. in Dall, 1892, p. 293; Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2, p. 15.

Acutely ovate; spire conical; whirls [whorls] rounded, eight; body whirl large and ventricose; whirls [whorls] of spire reticulated; body whirl [whorl] with longitudinal ribs or undulations and very fine lines; revolving lines prominent, largest about the middle of the whirl [whorl], fine at the base; suture profoundly impressed.—[Conrad, 1860].

This distinct genus was described by Conrad from a single Claibornian species. In the year following, the part of Deshayes[339] An. sans Vert. was published which contained the descriptions of four species of his genus *Mesostoma*. The forms are generically alike and Deshayes's name falls in synonymy. Shells thought to be distinct from Conrad's species were given different names by Heilprin and Aldrich. Dall suggested the specimens belonged to *C. prima* which apparently is their correct position.

The aperture of the species is distinct in outline. The opening is circular. The margin of the outer lip flares along the anterior margin so that the anterior line is straight. The canal is short, twists to the left and forms a quadrate outline to the left anterior portion of the aperture. On some specimens the callus does not cover the umbilical area and leaves a slight opening. Heilprin's figure of *Mesostoma rugosa* shows distinctly the quadrate outline of the left, anterior margin of the aperture. Aldrich's picture of *C. lisbonensis* does not accentuate the character but the resemblance is enough to warrant the belief that it is the same species.

[338]Conrad, T. A., Acad. Nat. Sci. Phila., 2d. ser. Jour., vol. IV, p. 295, 1860.

[339]Deshayes, G. P., 1861, tome 2, p. 416; see Newton, R. B., 1891, p. 309, for date.

The longitudinal costæ tend to become obsolete on the younger whorls so that on large adult specimens spiral ribs only are present on the body whorl and on the penultimate whorl. A good example of the sometimes unimportance of crenulations on the inner surface of the labrum is noted in the collection of this species. The species would be characterized as having a thin outer lip with a smooth interior. There is a perfect specimen in the collection which has the labrum thickened and the interior has a well developed series of crenulations.

De Gregorio evidently missed the original reference to the species and consequently was at a loss to know the identity of the form.

The *Cerithioderma spirata* Meyer[340] of the Jackson Eocene was identified by Dr. Dall,[341] after an examination of the type, as a *Litiopa*.

The largest of the three Conradian specimens is selected as the lectotype. Heilprin figured the smaller of two specimens which he had.

Dimensions.—Height, 15 mm.; greatest diameter, 11 mm., lectotype. Height, 6 mm.; greatest diameter, 4.5 mm., holotype *Mesostoma rugosum* Heilprin.

Lectotype.—Academy of Natural Sciences, Philadelphia. Holotype *M. rugosa* Heilprin, No. 10297/1, Cat. No. 5552/1 American Museum of Natural History, New York, N. Y.

Occurrence.—Lower Claiborne: locality 734. Gosport sand: 104 (type).

Family "CERITHIIDÆ"

Genus CERITHIUM Bruguière, 1792[342]

Genotype by tautonymy *C. adansonii* Bruguière[343]="Le Cerite" Adanson. Living, West Africa, Gambia R.

The name *Cerithium* is here used following Stewart's method of saving the well known name. This interpretation is forced. Strictly *Cerithium* is a synonym of *Clava* Martyn, 1784. Be-

[340]Meyer, O., Bericht Senck. Natur. Gesell für 1886, p. 8, pl. 1, fig. 7, 1887.

[341]Dall, W. H., 1892, p. 292.

[342]Bruguière, J. G., Encycl. Méthod. Hist. Nat., vol. 1, p. XV, 1789; Bruguière, J. G., ibid, p. 467, 1792.

[343]Stewart, Ralph, 1926, p. 355; Woodring, W. P., 1928; p. 333; Cox, L. R., 1927, p. 85.

cause the problem has not been definitely worked out *Cerithium* auct. is used for the present.

Cerithium Whitfieldi (Heilprin) Plate 28, fig. 8

Rostellaria Whitfieldi Heilprin, 1879, Acad. Nat. Sci. Phila., Proc., vol. 31, p. 216, pl. 13, fig. 14.

Cerithium Whitfieldi Heilprin, 1891, p. 401; Dall, 1892, p. 286.

Shell fusiform; spire tapering, consisting of about nine flattened volutions; body-whorl sub-angulate beneath; columella flexuous, with traces of an obtuse fold; outer lip with a swollen prominence in the apertural region; wing?

Length 3-4 inches.

Claiborne, Ala.

Named in honor of R. P. Whitfield, Esq., the distinguished American paleontologist and colaborer with Prof. James Hall in the great work on the paleontology of the State of New York.

Two specimens of this species, both unfortunately bereft of their wings, are in possession of the American Museum of Natural History of New York. Their characters are so decidedly at variance with those of any other American Eocene *Rostellaria*, that we feel no hesitation in applying to them a specific name, although the broken nature of our specimens necessitates an incomplete description. Allied species occur in the London clay and in the Paris basin.—[Heilprin, 1879].

This large, typical *Cerithium* in shape is unique because of the lack of abundant *Cerithium* species in the Clabornian fauna. The species is as yet known only from an incomplete specimen. Meyer[344] thought that this form was the same as "*C.*" *vinctum* Whitfield. The two species are distinct. "*C.*" *vinctum* has a collar below the suture and has longitudinal folds which become obsolete with age.

Dimensions.—Height, 81 mm.; greatest diameter, 40 mm.

Holotype.—No. 10166/1, Cat. No. 5566/1, American Museum of Natural History, New York, N. Y.

Occurrence.—Gosport sand: locality 104.

"Cerithium" solitarium Conrad Plate 28, fig. 5; Plate 83, fig. 4

Cerithium solitarium Conrad, 1834, Acad. Nat. Sci. Phila., Jour. vol. VII, p. 147; Conrad, 1848, ibid, new ser. I, p. 132, pl. 14, fig. 28; H. C. Lea, 1848, p. 98; d'Orbigny, 1850, p. 368; de Gregorio, 1890, p. 118; Dall, 1892, p. 271.

Cerithiopsis solitaria Conrad, 1865, p. 29.

Cleidomera solitaria Conrad, 1866, p. 14.

Shell subulate, volutions nine or ten, not convex, and each with four nodulous spiral lines.

Locality.—Claiborne, Alabama.—[Conrad, 1834].

The species was described from Claiborne. A fragment of two whorls of the specimen occurs in the Harris collection. The diameter of the whorl is 13 mm.

De Gregorio placed *C. tombigbeensis* Aldrich as synonymous.

[344]Meyer, O., Bericht Senck, natur. Gesellschaft, p. 18, 1887.

In De Gregorio, Meyer is incorrectly given as the author. *C. tombigbeensis* might be related but it is not specifically the same as the Claiborne form.

Dimensions.—Height, 22 mm.; greatest diameter, 9 mm., lectotype.

Lectotype.—Academy of Natural Sciences Philadelphia, Pa.

"Cerithium" claibornensis Conrad Plate 83, fig. 3

Cerithium claibornensis Conrad, 1848, Acad. Nat. Sci. Phila., Jour., 2d. ser. vol. I, p. 132, pl. 14, fig. 32; de Gregorio, 1890, p. 120 *Cerithiopsis;* Dall, 1892, p. 271.

Cerithiopsis claibornensis Conrad, 1865, p. 29.

Cleidomera claibornensis Conrad, 1866, p. 14.

Turreted, with longitudinal oblique crenate ribs and obscure revolving lines; body whorl without ribs, and having in place of them a few distinct lines; near the suture is a series of prominent tubercles; angle towards the base bicarinate; base flattened, and having two fine revolving lines.

Locality.—Claiborne, Alabama.

A fragment only was found, which the figure represents.—[Conrad, 1848].

This species was described from a fragment which consisted of two, lower whorls. It has not been discovered since Conrad's time. It was described from Claiborne.

The sculpture as indicated by that on the two whorls of the holotype is similar to that of the Paris Basin Eocene species which Cossmann, placed under the section *Tiaracerithium* Sacco[345] of the subgenus *Serratocerithium* Vignal.

Dimensions.—Greatest diameter, 8 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Genus **Clava** Martyn, 1784[346]

(*Vertagus* (Klein) Schumacher, 1817 non Link, 1807.)

Genotype by subsequent designation, Pilsbry, 1901, *Clava rugata* Martyn (*Murex asper Linnæus*) Living. Indo-Pacific.

Subgenus **OCHETOCLAVA** Woodring, 1928[347]

Genotype by original designation, *Cerithium gemmatum* Hinds.

[345]Sacco, F., I Molluschi dei terreni terziarii del Piemonte e della Liguria, pt. XVII, p. 35, 1895 *Cerithium pseudotiarella* d'Orb. Miocene fide Cossmann, M., Essais Pal. Comp., 7 liv., p. 74, 1906.

[346]Martyn, T., 1784, vol. 1, No. 12-13; Dall, W. H., 1892, p. 290; Pilsbry, H. A., Acad. Nat. Sci., Phila., Proc. vol. 53, p. 392, 1901; Dall, W. H., Acad. Nat. Sci., Phila., Proc., vol. 59, p. 366, 1907; Wood, E., Ann. N. Y. Acad. Sci., vol. 20, No. 1, p. 7, 1910.

[347]Woodring, W. P., 1928, p. 334.

Living. Pacific Coast, Central America and Mexico.

Clava ("Ochetoclava") vincta (Whitfield) Plate 29, figs. 7, 10, 11, 15-19

Cerithium vinctum Whitfield, 1865, Amer. Jour. Conch., vol. 1, p. 265, pl. 27, fig. 8; Aldrich, 1887, Cincinnati Soc. Nat. Hist., Jour., vol. X, p. 80; Dall, 1892, p. 285, pl. 22, fig. 9.
cf. *Turritella miroplita* de Gregorio, 1890, p. 123, pl. 11, fig. 10.
Fastigiella vinctum (Whitfield) Cossmann, 1906, Essais Pal. Comp., 7 liv., p. 94.
Vertagus wechesensis Stenzel, in Renick and Stenzel, 1931, Univ. Texas. Bull. No. 3101, p. 87, pl. VI, fig. 8.

Shell regularly elongate, conical; volutions ten or more; flattened above, ventricose below, and becoming gibbous or irregularly contracted in the last volution of adult specimens, and ornamented by a revolving band, which occupies the lower half of the exposed part; upper part of the shell marked by small, closely-arranged longitudinal folds, which, in the larger volutions do not extend to the band, leaving it smooth, with the upper margin elevated; aperture oblique; columella sub-spiral; anterior canal slightly reflected.

Dimensions.—Length 1.45 inches, diameter of body whorl .5 inch.
Locality.—Vicksburg, Miss. Upper Eocene.—[Whitfield, 1865].

Through the courtesy of A. W. Slocum, of the Walker Museum, University of Chicago, photographs and measurements of the holotype of this species are included herein.

This is one of the several species of the Hale collection which Whitfield described and which in the course of labelling acquired a wrong locality. Whitfield stated the material was from Vicksburg, Miss. Aldrich corrected the error in 1887, and identified the material as from Lisbon, Ala. The Paleontological Research Institution collection contains the species from Lisbon, Ala. Dr. Dall did not make note of the change in the occurrence of the form in his discussion of the species in 1892, but continued the "Vicksburg" error.

Meyer[348] and Aldrich[349] supposed that the species was the young of *Rostellaria Whitfieldi* Heilprin[350] but Dall thought the two forms distinct and figured *vinctum.*

So far as the adult shell is known, the surface is smooth. A distinct, subsutural groove occurs which is striated longitudinally. The groove is well pronounced for it may be traced on badly worn specimens. The aperture has short, anterior and posterior canals. The species is Cerithoid as seen by the condition of the canals.

One specimen from near Linwood, Angelina County, Texas (loc. 758) has the coarse, longitudinal and spiral folds retained

[348] Meyer, O., Bericht Senck. natur. Gesell., p. 18, 1887.
[349] Aldrich, T. H., Cincinnati Soc. Nat. Hist., vol. X, p. 80, 1887.
[350] Heilprin, A., Acad. Nat. Sci. Phila., Proc., vol. 31, p. 216, pl. 13, fig. 14, 1879.

longer in its individual development than is typical.

The specimen figured and named new by Stenzel is typical *vinctum.*

Cossmann classified the form under *Fastigiella* Reeve[351] but the species in the writer's judgment does not belong to that genus which has a type with a deep suture, strongly carinated whorls and a well developed umbilicus.

This species is like the Miocene species of America which Woodring has designated *Ochetoclava* in having the shorter, more vertical, anterior canal.

It differs from typical *Ochetoclava* in the type of sculpture. Paris Basin species similar to *vinctum* in general shape and sculpture, Cossmann[352] placed in groups *Semivertagus* and *Pseudovertagus.* They have the sharp, recurved, horizontal anterior canal as in *Clava.*

C. vincta has a sutural groove which is distinct from *Clava* It is provisionally placed in *Ochetoclava.*

Dimensions.—Height, 33.8 mm.; width, 13.5 mm.—14.1 mm. (width measured at right angles and parallel to the aperture), holotype.

Holotype.—Whit. 1237, U. C. 24673, Walker Museum, University of Chicago, Chicago, Ill.

Occurrence.—Lower Claiborne: localities 732, 734 (type) and 758.

"Clava" plicifera Heilprin — Plate 29, fig. 12

Terebra plicifera Heilprin, 1880, Proc. U. S. Nat. Mus., vol. III, p. 151, fig. 8 included 1882, Smith. Misc. Coll., vol. XXII, p. 151; Heilprin, 1884, Cont. Tert. Geol. and Pal. U. S., p. 38, footnote; Heilprin, 1891, p. 398; Aldrich, 1897, Bull. Amer. Pal., vol. II. No. 8, p. 4, pl. 3, figs. 2, a.

This species is a Jackson Eocene form but because of its obscure generic affinities attention is called here to the resemblance between the apical whorls of this form and that of *C. vinctum* Whitfield of the Claibornian.

The *Terebra plicifera* Heilprin is without doubt a Cerithoid form. It is either the apical whorls of *C. vincta* or a related species, a complete specimen of which has not been identified. A drawing made by Prof. Harris of one of the Heilprin specimens

[351]Reeve, L., Proc. Zool. Soc. Lond., vol. 16, p. 15, 1848. Monotype *F. carinata* Reeve.

[352]Cossmann, M., Essais Pal. Comp., 7 liv., pl. III, figs. 4-7, 1906.

from the Atascosa County, Texas which are in the United States National Museum is herein included. The original figure by Heilprin is a specimen with more longitudinal folds. Aldrich, in Bull. Amer. Pal. gave further drawings of an U. S. Nat. Museum specimen.

The type is No. 8919, U. S. Nat. Museum and the type locality is Atascosa County, Texas, Jackson Eocene, Fayette formation.

Genus **BITTIUM** Leach in Gray, 1847[353]

Genotype by subsequent designation, Gray, 1847,[354] *Murex reticulatus* Montagu. Living. Europe.

Subgenus **STYLIDIUM** Dall, 1907[355]

Genotype by original designation, *Turritella eschrichti* Middendorff=*Bittium eschrichti*. Recent. Northwest Coast North America. Pliocene. Oregon and California.

Bittium (Stylidium) elegans (H. C. Lea) Plate 27, figs. 1, 2; Plate 83, fig. 18

Pasithea elegans H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 93, pl. 1, fig. 3; H. C. Lea, 1848, p. 103; Harris, 1895, p. 18.
Pyramis elegans (H. C. Lea) de Gregorio, 1890, p. 160, pl. 15, fig. 38.
Turbonilla elegans (H. C. Lea) Dall, 1892, p. 255.
Acirsella elegans (H. C. Lea) Cossmann, 1893, p. 25, pl. II, fig. 7.
Bittium elegans (H. C. Lea) Bartsch, 1910, in Aldrich, Nautilus, vol. 24, No. 7, p. 75.
Acirsa (*Acirsella*) *elegans* (H. C. Lea) Palmer, 1928, Jour. Pal., vol. 2, No. 1, p. 31, pl. 7, fig. 4.

P. testâ subulatâ, transversè sulcatâ, imperforatâ, subcrassâ, politâ; apice acutâ; anfractibus nonis, planulatis; sutures minimis; ultimo anfractu ad basim striato; columellâ læve; aperturâ sub-effusâ.

Shell subulate, transversely sulcate, imperforate, somewhat thick, polished; apex acute; whorls nine, flat; sutures very small; last whorl striated to the base; columella smooth; mouth sub-elliptical, somewhat effuse.

Length .3. Breadth .1 of an inch.

Remarks.—This pretty little shell has five striæ on each whorl, except the last, on which there are fifteen, those near the base being much smaller than the others; but as I have only one specimen, I cannot tell whether this is a constant character or not. It resembles the *P. sulcata*, Lea, in its furrows, but differs from it in other respects.—[H. C. Lea, 1841].

The figure given by Lea for his species is poor. The included Meyer drawing of the type specimen reveals the character of the spiral ribbing.

In the original discussion of the species *B. henryleai* (Palmer), the author brought out the difference between the two species.

[353]Leach, W. E., in Gray, J. E., Ann. Mag. Nat. Hist., vol. 20, p. 270, 1847.

[354]Gray, J. E., Proc. Zool. Soc. Lond., p. 154, 1847.

[355]Dall, W. H., in Bartsch, P., U. S. Nat. Mus., Proc., vol. XXXIII, No. 1564, p. 178, footnote, 1907; Dall, W. H., p. 76.

A specimen which has seven, spiral ribs on the whorls. Cossmann figured as *elegans.* He described his specimens as having five to seven spirals. Lea's specimen is described as having five. There are sometimes six on *B. henryleai.* The number probably varies in both species. Cossmann's specimens may not be typical *elegans.*

Dr. Bartsch identified (published in Aldrich) the species as a *Bittium.* The species has the sculpture strikingly like the Recent West Coast type of *Bittium, B. eschrichti,* which has smooth, nuclear whorls and lacks an anterior canal or notch.

Dimensions.—Height, 7.5 mm.; greatest diameter, 2.5 mm., lectotype.

Lectotype.—No. 13168, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Bittium (Stylidium) henryleai (Palmer) Plate 27, figs. 3, 4, 6

Acirsa (*Acirsella*) *henryleai* (Palmer) 1928, Jour. Pal., vol. 2, No. 1, p. 29, pl. 7, figs. 3, 9, 10.

Holotype.—No. 350; paratypes 354 and 355, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 776.

Genus **BITTIOLUM** Cossmann, 1906[356]

Genotype by original designation *Bittium podagrinum.* Pliocene. Florida.

"Bittiolum" webbi (Harris) Plate 28, fig. 4

Cerithium webbi Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 79, pl. 9, fig. 3.

General form of young specimens as shown in the figure; whorls about 9; spiral ones marked by two submedial approximate spiral rows of crenules or nodes above which, and just below the suture, is a third row with smaller crenulations; suture deep and broad; body whorl marked somewhat as those above though the lower submedial row of crenules is faint, and below it to the end of the beak occur spiral raised lines of varying strength; the entire surface is apparently covered with minute revolving lines; lines of growth on the body whorl start at right angles to the suture above, pass downward to the middle of the whorl, curve gradually forward and, after reaching the base of the whorl, slowly again curve backward and pass downward on the canal.

Locality.—Rio Grande, 13 miles by river below Laredo, or 9 by river above the Webb-Zapata County line, Texas side.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

[356]Cossmann, M., Essais Pal. Comp., 7 liv., p. 139, 1906.

This short, stout, *Bittium*-like shell is not typical but presents a relationship with the genus *Bittiolum* as so far known. The nuclear whorls are smooth. *"B." webbi* apparently lacks the varix of typical *Bittiolum* as well as the spiral lines on the lower part of the body whorl. Woodring, 1928, revised Dall's original description of the type species of the genus by explaining that the original figure shows a too rounded aperture and that a short, anterior canal is present. Such a character makes the Claibornian species more true to type although the columella line is probably straighter than that of *B. podagrinum* Dall would be in spite of an anterior canal.

Harris does not include in the published notes of the species the reference to specimens in the U. S. Nat. Mus. collections but in his Eocene Texas MS. report, he states that the Texas Survey specimens were probably immature. He adds that the specimens in the U. S. Nat. Mus. "from the same locality show a more *Cerithium*-like body whorl and aperture."

The species is known from incomplete specimens, which do not present the full characters of the form well enough to classify the genus as new.

Dimensions.—Height, 19 mm., (type figure).

Holotype.—Geology Department, University of Texas, Austin, Texas.

Doubtful forms

Cerithium bicostellatum was described by Conrad from the Eocene of St. Matthew's Parish, Orangeburg, S. C. but not figured. The following description occurs in the Acad. Nat. Sci. Phila., Proc. vol. IV, p. 298, 1847, and is repeated in the Journal of the same publication, 2d. ser., vol. 1, p. 129, 1848: "Turreted: volutions eight or nine, angular and carinated below the middle; body whorl bicarinated. Length 5/8." From the description it would seem that the species more likely belongs to *Cerithiella.*

The type was not found at the Academy of Natural Sciences.

Cerithium siliceum Conrad from the Eocene of St. Matthew's Paris, Orangeburg District, S. C., published in the Acad. Nat. Sci., Phila., Proc., vol. IV, p. 298, 1847, repeated and figured in the Journal of the same publication, 2d. ser., vol. 1, p. 129, pl. 14, fig. 1, 1848, is doubtfully a *Cerithium*. A portion of a specimen is figured. The description is as follows: "Turreted; whorls rounded below, contracted or concave above, and with revolving lines; suture profound. A fragment. Width 2/3".

The type was not found at the Academy of Natural Sciences.

Cerithium striatum Lea, 1833, p. 131, pl. 4, fig. 122 is *Mesalia vetusta* Conrad. *C. sagenula* Conrad in Morton Syn. Org. Remains Cret. Group. App., p. 5 is a nomen nudum.

Cerithium misgum de Gregorio, 1890, p. 118, pl. 10, fig. 29; Dall, 1892, p. 277 (*Astyris*) is probably *Mitrella* (*Columbellopsis*) *elevata* (Lea). It is not a *Cerithium* but belongs in the Columbellidæ.

Cerithium miturum de Gregorio, 1890, p. 118, pl. 10, fig. 27; Dall, 1892, p. 277 (*Anachis*) is probably *Dentiterebra prima* Meyer.

Cerithium (*Cerithidea*) *agnotum* de Gregorio, 1890, p. 117, pl. 10, fig. 24; Dall, 1892, p. 277 (*Pseudomelania*) suggests a *Mesalia* from the apical sculpture and aperture. Judging from the sculpture on the lower whorls, the specimen is not normal.

Cerithium persum de Gregorio, 1890, p. 118, pl. 10, fig. 39; Dall, 1892, p. 277, (*Pseudomelania*) might be a worn *Mesalia*. De Gregorio states the species is doubtful. Many of De Gregorio's names ought never to have been given.

Cerithium lucrosum de Gregorio, 1890, p. 117 under *C. agnotum* is a nomen nudum.

Family CERITHIOPSIDÆ

Genus SEILA A. Adams, 1861[357]

Genotype by subsequent designation, Dall, 1889,[358] *Triphoris dextroversus* Adams and Reeve. Living. China Sea.

Seila constricta (H. C. Lea) Plate 30, figs. 5, 12, 13

Terebra constricta H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, April, p. 100, pl. 1, fig. 18; H. C. Lea, 1848, p. 106; Harris, 1895, p. 12.

Cerithium trilineatum Meyer, 1884, Acad. Nat. Sci. Phila., vol. 36, p. 105; Heilprin, 1884, Cont. Geol., p. 95 non *C. trilineatum* Philippi, 1836, En. Moll. Sicil., I, p. 195, pl. XI, fig. 13.

Cerithiopsis constricta (H. C. Lea) Meyer, 1887, Bericht Senck. natur. Gesell., p. 8, pl. II, fig. 23 a, b.

Cerithium (*Cerithiopsis*) *constrictum*, de Gregorio, 1890, p. 119, pl. 10, figs. 30-32.

Newtoniella constricta (H. C. Lea) Cossmann, 1893, p. 30.

Seila constricta (H. C. Lea) Dall, 1892, p. 267; Cossmann, 1906, Essais

[357]Adams, A., Ann. Mag. Nat. Hist., ser. 3, vol. 7, p. 131, 1861.
[358]Dall, W. H., Bull. Mus. Comp. Zool. Harvard, vol. XVIII, p. 250, 1889.

Pal. Comp., 7 liv., p. 154.
T. testâ subulatâ attenuatâ, crassâ, transversè striatâ, striis tribus, longitudinaliter lineatâ; spirâ, acuta, valdè elevata; anfractibus—, planulatis impressis; columellâ lævi; aperturâ sub-quadrilaterali; canale parvo, reflexo.

Shell subulate, attenuate, thick, transversely striate, with three striæ, longitudinally lined; spire very elevated, acute; whorls—, flat; sutures impressed; columella smooth; mouth subquadrilateral; channel small, reflexed.

Length.— ——. Breadth .1 of an inch.

Remarks.—But two specimens of this shell, and both with the spire very much fractured, have come under my observation, yet their shape is such as to leave no doubt in my mind that the spire is acute and very attenuate, in which it resembles most Terebræ. It approaches T. *venusta*, Lea, but differs from it in its transverse striæ, its want of longitudinal ribs, and in the channel being more reflexed.—[H. C. Lea, 1841].

This species is remarkably close to the type of the genus as compared with the figure of *Triforis dextroversus* Adams and Reeve, in the Zoology of the Voyage of H. M. S. Samarang, pl. XL, fig. 31, 1848. Meyer found and figured the embryonic whorls of *constricta*. The young whorls according to his specimens are sculptured with longitudinal ribs. On the adult shell under the lens, the longitudinal lines of growth appear conspicuous.

Dimensions.—Height, 6 mm.; greatest diameter, 3 mm., lectotype.

Lectotype.—No. 13159, Academy of Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

"Seila" quadristriaris (Meyer and Aldrich) Plate 30, fig. 6

Cerithiopsis quadristriaris Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour., vol. IX, No. 2, p. 43, pl. II, fig. 5; Dall, 1892, p. 268.
Cerithium (*Cerithiopsis*) *quadristriaris* de Gregorio, 1890, p. 120, pl. 10, fig. 33 non pl. 11.
Newtoniella quadristriaris (Meyer and Aldrich) Cossmann, 1893, p. 31.

Subulate. Whorls flat, covered by four smooth, elevated, spiral lines, with nearly equal distances. The two in the middle are smaller than those near the sutures. Suture defined by a very small, elevated revolving line.

Newton, Miss., Claiborne, Ala.

The type is from Newton.—[Meyer and Aldrich, 1886].

This species, with four, spiral ribs seems to be distinct from the trilineate character of *constricta*. It is known from a fragment. It is placed under *Seila* because of its lack of axial ribs.

Dimensions.—Greatest diameter, 3 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University. Baltimore, Md.

Occurrence.—Lower Claiborne: Newton, Miss. (type). The authors did not differentiate whether the specimens from Claiborne came from the Gosport sand or from the lower horizon.

Genus **CERITHIELLA** Verrill, 1882[359]

(*Lovenella,* Sars, 1878, nec *Lovenella,* Hincks, 1869, Hydroida; *Newtonia* Cossmann, 1891, nec *Newtonia,* Schlegel, 1866; Newtoniella Cossmann, 1893,[360] nec *Cerithiolinum* Locard, 1903).

Genotype by original designation, *Cerithium metula* Lovén. Living. Western Europe.

Cerithiella nassula (Conrad) Plate 29, figs. 3, 9; Plate 83, fig. 2

Cerithium nassula Conrad, 1834, Acad. Nat. Sci. Phila., Jour. VII, pt. 1, p. 156; Conrad, 1848, ibid, 2d. ser., vol. 1, pl. 14, fig. 29; H. C. Lea, 1848, p. 98; Harris, 1895, p. 29.
Cerithiopsis nassula Conrad, 1865, p. 29.
Cerithium (*Cerithiopsis*) *nassula* (Conrad) de Gregorio, 1890, p. 119, pl. 10, figs. 26b non 25 (error in text 26a in place of 25 for *C. aldrichi*).
Cleidomera nassula Conrad, 1866, p. 14.
Cerithiopsis (*Lovenella*) *nassula* (Conrad) Dall, 1892, p. 270; Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 11.
Newtoniella nassula (Conrad) Cossmann, 1893, p. 31.
Cerithiopsis conica Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 12, pl. 1, fig. 4 young; Harris, 1899, Bull. Amer. Pal. vol. III, No. 11, p. 73, pl. 9, fig. 8.
Newtoniella conica (Aldrich) Cossmann, 1906, Essais Pal. Comp., 7 liv., p. 153.

Shell subulate, whorls about thirteen, cancellated; longitudinal and spiral lines equal, crossing at right angles, forming square, smooth and concave intervening spaces; spiral lines three on each whorl; suture margined by a prominent line; sutural space indented; labium reflected, forming a groove behind it. Length one inch and one-eighth.

Locality. Claiborne, Alabama. One specimen only was discovered.—[Conrad, 1834].

The statement in Conrad's description "longitudinal and spiral lines equal, crossing at right angles, forming square, smooth and concave intervening spaces" describes the shell better than the figure illustrates it even though the drawing does indicate such a character well. The longitudinal ribs are straight or curved only slightly in *C. heckscheri,* n. sp., which may be confused with *C. nassula,* the longitudinal ribs are curved and swing to the left at both sutures. Unfortunately the collections do not contain any nuclei or any young portions of the shells of the *Cerithiella* species. On the type specimen of *nassula* there are eleven, longitudinal ribs. On specimens of the species from Wautubbee, Miss., there are twelve to thirteen, longitudinal folds on the body whorl.

[359] Verrill, A. E., Trans. Conn. Acad. Arts and Sci., vol. 5, pt. 2, p. 522, 1882.

[360] Iredale, Tom, Proc. Mal. Soc. Lond., vol. 9, p. 261, 1911; Iredale, Tom, ibid, vol. 13, p. 30, 1918.

On *C. heckscheri,* the number of longitudinal ribs increases until there are twenty to thirty ribs. It is true that the number of ribs decreases on the apical whorls so that a fragment representing the first or older whorls of the species would have fewer, longitudinal ribs. One therefore must bear in mind what stage of growth a fragment represents and when comparing with other species, compare a portion of the shell with one of equivalent age. The earlier whorls of *C. heckscheri* would have a number of longitudinal ribs about equal to the number of longitudinal ribs on the body whorl of *nassula.*

Small nodes are developed at the intersection of the spiral and longitudinal ribs. Such sculpture also characterizes the other species of *Cerithiella* in the Clairbornian Eocene.

Judging from the size of the specimen, together with similar characters, *C. conica* Aldrich is a young specimen of *nassula.* The Harris collections contain a young specimen from Wautubbee, Miss., which is certainly the young of the species from the same locality which appear to be *nassula* and which exhibit the same characters as *C. conica. C. conica* has the characteristic straight, longitudinal ribs with eight longitudinal ribs and the typical nodose, tricostate shell. The fewer longitudinal ribs place the form near *nassula.* The corded, spiral ribs at the suture which Aldrich pointed out as unique for *C. conica* is a character which occurs on the earlier whorls of the spire and is lost on the adult. The corded suture is possessed by the young Wautubbee specimen.

Dall thought that *C. jacksonensis* Meyer[361] was the young of *C. nassula.* It is difficult to place a young specimen when the life history of the species is not known. But the fact that Meyer described his form as having five, spiral lines would argue against the Meyer specimen belonging to *nassula.* The tendency in the species of *Cerithiella* noted in the lower Claibornian, is for the ribs to increase with age which would have to be the case if Meyer's fragment was the young of a species. The author believes Meyer's *C. jacksonensis* is a valid species. Specimens are found, of both young and adult age, which have characters as described by Meyer.

[361]Meyer, O., Geol. Sur. Ala., Bull. I, pt. II, p. 71, pl. II, fig. 13, 1886 as *Cerithiopsis.*

For a similar reason the writer would not follow Meyer and Aldrich[362] in placing *C. langdoni* Aldrich[363] of the Red Bluff Oligocene with *nassula*. *C. langdoni* has five, revolving lines.

The several species placed in this paper under *Cerithiella* rather than Cerithiopsis[364] are so placed because they possess the longer and more twisted canal which *Cerithiella* has and because of their type of sculpture.

This species also resembles in type of sculpture *Laskeya subulata* (Montagu)[365] of the East Coast of the United States.

Dimensions.—Height, 30 mm.; greatest diameter, 9 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Sabine: Woods Bluff, Ala. (*C. conica* Ald. Harris). Lower Claiborne: localities 728, 731 and 803. Gosport sand: locality 104 (Conrad) Bakers Bluff, on the Tombigbee River, near St. Stephens and White's marl bed, Monroe County, Ala. (*C. conica* Aldrich).

Cerithiella aldrichi (Meyer) Plate 29, fig. 2

Cerithiopsis aldrichi Meyer, 1886, Bull. Geol. Sur. Ala., No. 1, pt. II, p. 71, pl. 2, fig. 14; Dall. 1892, p. 270 section *Metaxia;* Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 11.

Subulate; whorls convex; oldest whorls covered by four spiral lines; the second one from above is the smallest and last developed one; they are covered by transverse ribs, about twelve on each whorl; the embryonic whorls are numerous and rounded—on the oldest of them the spiral lines commence to appear, while the others are only covered by numerous curved, transverse ribs. Base covered with minute elevated, revolving lines, the outermost of which is larger; canal reflected.

Localities.—Red Bluff, Miss., Jackson, Miss., Claiborne, Ala.—[Meyer, 1886].

The species is distinct from *C. nassula* Conrad as Dall maintained in 1892. De Gregorio and Cossmann believed it to be synonymous with *C. nassula.* The number of spiral ribs is the same on both species but the contour of the whorls is different. *C. aldrichi* has more rounded whorls. The holotype has long, sharp

[362]Meyer, O. and Aldrich, T. H., Cincinnati Soc. Nat. Hist., Jour., vol. IX, p. 48, 1886.

[363]Aldrich, T. H., Cincinnati Soc. Nat. Hist., Jour., vol. VIII, p. 151, pl. 3, fig. 14, 1885 as *Cerithium.*

[364]Forbes, E., and Hanley, S., Hist. of British Mollusca, vol. III, p. 634, (1851 temporary title page), 1853. Monotype *C. tubercularis* (Montagu). Living. Western Europe.

[365]Dall, W. H., Bull. Mus. Comp. Zool., vol. XVIII, p. 252, pl. XX, fig. 4. 1889 as *Eumeta;* Iredale, T., Proc. Mal. Soc. Lond., vol. 13, p. 30, 1918, *Laskeya* substitute for *Eumeta* (Mörch, 1868) Fischer.

nodes at the intersection of the longitudinal and spiral ribs.

The holotype came from Red Bluff, Miss. Oligocene.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Cerithiella heckscheri, new species Plate 29, figs. 1, 5, 6, 13, 14

Shell medium, sides of the whorls straight; apical whorls unknown; surface sculptured with coarse, spiral and longitudinal ribs making a conspicuous cancellation; upper and lower margins of the whorl form coarse, revolving ribs; the suture is sunken; a middle, spiral rib is smaller in size; the upper and middle whorls of the spire have the tricostate character but on the body whorl and irregularly on the lower whorls of the spire a finer, fourth, spiral rib occurs between the central rib and the upper; fragments of specimens from the tricostate parts give only part of the life history of the species and give a wrong impression of the species; spiral ribs cross numerous, longitudinal ridges, the intersections of the two are finely nodose; body whorl sharply carinated from the last suture; below the carination there may be one or two coarse, revolving lines followed by fine, spiral lines; the surface appears smooth when the callus covers all of the surface as it frequently does; anterior canal fairly long and twisted to the right.

The species is common in the lower Claibornian at Wautubbee, Miss.

This species has been differentiated from its closest relative *C. nassula* (Conrad) under the discussion of that species.

This fine *Cerithiella* is named in honor of Mr. August Heckscher whose generous financial assistance for research at Cornell University aided in a portion of this work.

Holotype.—No. 2942; paratypes Nos. 2941, 2943 and 2944, Paleontogolical Research Institution.

Occurrence.—Lower Claiborne: localities 728, 731 and 803.

Cerithiella preconica, new species Plate 29, figs. 4, 8

Shell slender; sides straight; suture distinct not grooved; surface sculptured with three, prominent, spiral ribs which cross eight or nine, low, longitudinal folds; longitudinal folds straight or slightly curved; canal short and twisted to the left; base of the body whorl smooth; apical whorls unknown.

This species is like *C. nassula* (*conica*) and *C. heckscheri* in having three, prominent spiral ribs and in having straight sides to the whorls. The species differs from *C. heckscheri* in having fewer longitudinal ribs, and differs from both species in having the longitudinal ribs less developed so that the character of the sculpture is not cancellated as in *nassula* and *heckscheri*. In those two species the suture is deeply grooved by the pronounced, spiral ribs above and below. Such a feature is not so strongly developed in *C. preconica*.

Holotype.—No. 2948; paratype No. 2947, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 731. Gosport sand: locality 104.

Family TRIPHORIDÆ

Genus TRIPHORA[366] Blainville, 1828[367]

Genotype by monotypy *Triphora gemmatum* Blainville (*Cerite* [*Cerithium*] *tristome* Blainville, 1825). Living. Mauritius.

Triphora distinctus (Meyer) Plate 30, figs. 2, 3

Triforis distinctus Meyer, 1886, Geol. Sur. Ala., Bull. vol. 1, pt. II, p. 73, pl. 1, fig. 5; de Gregorio, 1890, p. 117, pl. 10, fig. 13 [error spelled *distructus*]; Cossmann, 1893, p. 31; Dall, 1892, p. 264 [? Chipola beds].

Small, slender; whorls convex, with three noduliferous, longitudinal lines, the uppermost of which is the smallest; suture marked by a small, plain elevated spiral line; mouth subquadrate; base with a distinct and an indistinct spiral line; length of the five lower whorls, two and one-half mm.

Locality.—Claiborne, Ala.

The species is very distinct from the preceding in its convex whorls and in the line along the suture. Owing to the lowest spiral, the whorls appear almost carinated at their lowest part. An essential characteristic is in the upper line being the smallest and apparently last developed, the species resembling, in this point, the German Tertiary *Cerithium* (*Triforis*) *Fritschi*, v. Kœnen*.—[Meyer, 1886].

**N. Jahrb. f. Mineralogie*, etc., 1882 Beilageband II,. p. 271, pl. 6, fig. 19.

Specimens of this species are not in the Harris collection. The characters seem to be distinct.

The Miocene distribution of this species as reported by Dall is based on comparison of imperfect type specimens with Chipolan material. His further description of the species is probably taken from the Miocene shells.

[366]*Triphora*, Blainville, 1828, stands for these unique shells although Deshayes had the form well in mind in 1823-24 (Desc. Coq. Fos. Env. Paris, tome II, p. 429, 1834) but his description and name *Triforis* was not published until 1834. For the date of Deshayes memoir parts see Newton, R. B., 1891, p. 309.

[367]Blainville, H. M. de, 1828, p. 344.

Holotype.—Not found[368].

Triphora major (Meyer) Plate 30, figs. 1, 4, 8, 9

Triforis major Meyer, 1886, Geol. Sur. Ala., Bull. No. 1, pt. II, p. 72, pl. 1, fig. 6; de Gregorio, 1890, p. 116, pl. 10, fig. 14 [thought variety of *T. similis* Meyer]; Dall, 1892, p. 266; Cossmann, 1893, p. 31 *Ogivia;* Cossmann, 1906, Eaasis Pal. Comp., 7 liv., p. 168.

Large; whorls flat, lower whorls with three longitudinal lines, formed by nodules of equal number in each line; the nodules of the uppermost spiral are the largest and touch nearly those of the middle line; they are rounded and separate from each other; those of the two lower spirals are compressed; the middle is the smallest and apparently last developed; base flattened with a distinct impressed line along its margin; length of the two lower whorls, five mm.

Locality.—Claiborne, Ala.—[Meyer, 1886].

The aperture and canals of the specimens of this species are broken as they are on all of the specimens of the Triphoridæ in the collections studied. It is therefore an uncertain determination to place these species in subgenera.

Cossmann in 1893, suggested that this species was an *Ogivia* subgenus of *Triforis.* The type of *Ogivia* Harris and Burrows[369] is *Triforis singularis* Deshayes[370] of the Paris Basin Eocene.

Dimensions.—5 mm., greatest diameter (large specimen).

Holotype.—Not found[371].

Occurrence.—Lower Claiborne: localities 728 and 731. Gosport sand: locality 104 (type).

Triphora similis (Meyer) Plate 30, figs. 7, 10, 11

Triforis similis Meyer, 1886, Geol. Sur. Ala., Bull. vol. I, pt. II, p. 71, pl. 1, figs. 8, 8a; de Gregorio, 1890, p. 116, pl. 10, fig. 15; fig. 16 var. *meyeri;* Cossmann, 1893, p. 31 *Epetrium;* Dall, 1892, p. 266.

Slender; whorls flat, covered with three longitudinal lines of nodules; the middle line the smallest and apparently last developed, but on the lower whorls equal in size to the other two; mouth quadrate; base flattened, with a distinct impressed line along its margin; suture very distinct. Length of the last five whorls, three mm.

Locality.—Claiborne, Ala.

The species is very similar to the Miocene *Cerithium moniliferum,* H. C. Lea,* which I do not have. Besides, it resembles very much that species

*Trans. Am. Philos. Soc., IX, Second Series, 1843, p. 269, pl. 37, fig. 92; and Emmons' *Rep. North Carolina Geol. Surv.,* p. 269, fig. 159.

[368] Search was made at the Geology Department, Johns Hopkins University, Baltimore, Md., and at the Alabama Museum of Natural History, University, Ala.

[369] Harris, G. F. and Burrows, H. W., 1891, p. 112, substitute for *Metalepis* Jousseaume, 1884 non Grote, 1875.

[370] Deshayes, G. P., 1865, tome III, p. 244, pl. 82, figs. 1-5 (error in explanation of plates).

[371] Search has been made in the Geology Department, Johns Hopkins University and the Alabama Museum of Natural History, University, Ala.

of the German Oligocene of Waldbœckelheim, which had been considered as the recent *Triforis perversus*, L., but which v. Kœnen calls *Cerithium Bœttgeri*.** I am of the opinion that this German form is a true *Triforis*. One of my larger specimens, with an outer lip more complete than is commonly the rule, has the canal nearly closed. The absence of a third opening is no absolute proof, as some recent sure species of *Triforis* (for instance, *Trif. nigro-cinctum*, Ad., of the American Coast) usually do not show it. The number of spiral lines on the base of this German species is variable, depending mainly, but not alone, upon the size of the shell. A few of the largest specimens are distinguished by a fourth line of nodules on the last whorls.—[Meyer, 1886].

**v. Kœnen, *Norddeutsch. Miocæn., Zweiter Theil; N. Jahrb. f. Mineralogie*, etc., 1882, Beilageband II., p. 272.

De Gregorio named the *Triforis* sp. of Meyer, described on p. 72 and figured pl. 1, fig. 7 of the above publication, *T. meyeri* and made it a variety of *similis*. Specimens of *meyeri* are not available to determine its relationship. Dall doubted the determination and thought it a fragment of "a young *meridionalis* Meyer" of the same publication as *similis*.

The anterior canal of *similis* as seen on the only specimen on which it is preserved, is curved to the left. It is curved somewhat like *T. costulatus* Deshayes[372] but the rest of the aperture as indicated by the imperfect outline, would probably not be the same. The canals of *T. similis* are not wholly typical of *Triphora* as seen on Blainville's figure, pl. 20, fig. 3, 1827.

Cossmann[373] suggested that the species belonged in *Epetrium* Harris and Burrows[374] genotype *Triforis grigonensis* Deshayes of the Eocene of the Paris Basin.

Dimensions.—3 mm., greatest diameter.

Holotype.—Not found[375].

Occurrence.—Gosport sand: locality 104.

Family **CYPRÆIDÆ**

True *Cypræa* does not occur in the Claibornian fauna as known thus far. *Cypræa*-like forms are fairly common in the deposits but the greater number belong to the Amphiperatidæ. There is as yet only one or two species representing the Cypræidæ. Several species of the same genus *Cypræorbis* (*Bernaya*) occur in the

[372]Deshayes, G. P., 1865, ibid, p. 242, pl. 82, figs. 20, 21.

[373]Cossmann, M., 1893, p. 31.

[374]Harris, G. F. and Burrows, H. W., 1891, p. 112 substitute name for *Stylia* Jousseaume, 1884 non Robineau—Desvoidy, 1803 in Insects.

[375]Search was made at the Geology Department, Johns Hopkins University, Baltimore, Md., and at the Alabama Museum of Natural History, University, Ala.

mid-Eocene of the Paris Basin. Schilder reports six species in the Paleocene of Europe[376].

Among the Claibornian genera there is a tendency toward ribbing. This is seen, in the partially striated forms such as *kennedyi,* and the completely striated and cancellated species of *Cypræedia.*

The genera determination of *kennedyi, vaughani* and *transovuloides* is only suggestive, waiting the time when more is known about the American Cypræacea.

Genus **CYPRÆORBIS** Conrad, 1865[377]

(*Bernaya* Jousseaume, 1884).

Genotype by monotypy *C. sphæroides* Conrad. Vicksburg Oligocene. Mississippi.

Cypræorbis nuculoides (Aldrich) Plate 30, figs. 16-18

Cypræa nuculoides Aldrich, 1903, Nautilus, vol. 16, No. 9, Jan., p. 98, pl. III, figs. 4, 5, 6; Wheeler, 1909, Nautilus, vol. 22, No. 10, p. 98.

Cypraeorbis nuculoides (Aldrich) Schilder, 1927, Archiv Naturg., 91, Abt. A, Heft. 10, p. 98.

Cypraeorbis alabamensis nuculoides (Aldrich) Schilder, 1932, Fossilium Catalogus, I, pars 55, p. 124.

Shell broadly ovate, rounded, globose, extremities slightly produced, surface smooth, basal callus heavy and extending upwards about one-third on each side, base flattened, rounded into the aperture, resembling in this respect *C. pinguis* Con., but broader. Aperture rather narrow, denticulated. Length 17 mm., greatest breadth 14 mm.

Localities: From the Claibornian at De Soto, Miss., McLeod's Mill, Miss., and Dubose's Mill, in West Alabama.

This species has a more flattened base than *S. spheroides* Con. and has a much heavier basal callus. The inner lip is smooth below the denticulations. —[Aldrich, 1903].

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Claibornian: De Soto and McLeod's Mill, Miss., Dubose's Mill, West Ala. (type). Gosport sand: Claiborne Bluff, Ala. (Wheeler).

Cypræorbis alabamensis (de Gregorio) Plate 30, figs. 19, 25, 26

Cypraea media alabamensis de Gregorio, 1890, p. 59, pl. 9, figs. 8-10.

Cypraea alabamensis (de Gregorio) Schilder, 1927, Archiv Naturg., 91, Abt. A, Heft 10, p. 98; Schilder, 1932 Fossilium Catalogus, I, pars 55, p. 124.

Testa ovata, turgida; apertura submediana, vix arcuata, angusta, antice vix dilatata, ad extremitatem anticam et posticam emarginata; dentibus utriusque labri pliciformibus, notatis, 15; *spira introrsa, immo vero paulo concava.*

[376] Schilder, F. A., Archiv Naturg. 91, abt. A, Heft 10, p. 89, 1927.
[377] Conrad, T. A., 1865, p. 31.

Je possède un seul exemplaire de cette intéressante espèce. Elle doit être très rare, car M. Conrad, dans ses nombreux travaux sur la faune de Alabama, ne cite aucune espèce de *Cypraea.* Notre exemplaire a beaucoup de ressemblance avec l'espèce de Vicksburg, avec laquelle je l'ai identifié; seulement il a une taille un peu plus petite et l'ouverture plus droite. Notre variété est très intéressante, car elle est intermédiaire entre la *spheroides* Conr. type et la *Cypraea media* Desh. (Deshayes Coq. Paris pl. 95, f. 37-38, dont elle diffère seulement par le dos un peu plus renflé.—(Coll, mon Cabinet).—[De Gregorio, 1890].

Wheeler found a *Cypræorbis* in the Gosport sand which he identified as *C. nuculoides* Aldrich. It may be that it is the same as *alabamensis* since De Gregorio's specimen is indicated as from the "sand". It also may be as Schilder has suggested that *nuculoides* is only a variety of *alabamensis.*

Holotype.—De Gregorio home, Via Mola 132, Palermo, Sicily.

Occurrence.—Gosport sand: Claiborne, Ala. (De Gregorio).

Doubtful forms

Cypræa lapidosa Conrad, 1842[378], is in Conrad's list of species from the lower Tertiary in South Carolina. It was never described or figured. The type is in the Academy of Natural Sciences at Philadelphia. It is an unrecognizable internal mold. The type measures height, 17 mm.; greatest diameter, 11.5 mm.

Cypræa semen Tuomey, non *C. semen* Cooke, 1919, and *C. hemispherica* Tuomey are nomina nuda. The names were given by Tuomey in his Report on the Geology of South Carolina, p. 209, 1848.

Cypræa sabuloviridis Whitfield 1892, U. S. Geol. Sur. Mon. XVIII, p. 223, pl. 33, figs. 20-22; Schilder, Archiv Naturg., 91, Abt. A. Heft 10, p. 74, 1927 [not lower Eocene as given]; known from casts which occurred in the Claibornian[379] Eocene, "upper layers of Upper Green Marls", at Shark River and Farmingdale, N. J.

Family **AMPHIPERATIDÆ ("OVULIDÆ")**

Genus **CYPRÆDIA** Swainson, 1840[380]

[378]Conrad, T. A., Proc. Nat. Inst., 2d. Bull., p. 174, in footnote, 1842; Dall, W. H., 1890, p. 165; Schilder, F. A., Fossilium Catalogus, I, pars 55, p. 243, 1932.

[379]Harris, G. D., Science, N. S., vol. XLIII, No. 1111, p. 532, 1916, Claibornian age of Shark River beds.

[380]Swainson, W., 1840, p. 325; Iredale, T., Proc. Mal. Soc. Lond., vol. 11, p. 178, 1914, "in or before May, 1840," exact date of Swainson.

Genotype by monotypy *C. cancellata* Swainson=*C. elegans* Sowerby (non *C. cancellata* Gmelin, 1799). Eocene. Paris Basin.

Cyprædia represents a common Eocene genus with distinct characters in spite of an obscure monotype. Swainson described the genus giving the single new species without further description of the species or indication of its occurrence except that it was fossil. One gains little definite subsequent knowledge as to the species. Authors[381] have omitted the monotype and give C. *C. elegans* Sowerby[382] as type without indication that Swainson's species is synonymous[383].

Dr. F. A. Schilder[384], the authority on the Cypræacea, in correspondence, stated that he believed that *C. cancellata* Swainson is identical with *C. elegans* Sowerby but that such information escaped publication in connection with the citation of the genotype of *Cyprædia.* The proof of the identity of Swainson's species is not absolute but probably as much so as can be determined, considering the original citation of the species. Dr. Schilder sent generously the following information regarding the problem:

"Cypraedia Swainson (1840) really is monotypical; the author cited cancellata nov. sp. as type, but he did not describe this species particularly, so that the description of the genus must be regarded as the description of the species too (see Opinion 43 of the Intern. Comm. Zoolog. Nomenclature); that description fits to 2 European species only, viz. Cypraedia elegans (Sow.) and C. aplisiopsis (Greg.); but the latter hardly was known at 1840, while elegans is a rather common species of the Paris Basin represented in most European collections. So it becomes most probable that the shell described by Swainson belonged to elegans (the description of which was evidently unknown to him). This view has already been shared by Herrmannsen (1846, Indices Gener. Malacoz., vol. 1, p. 358), who cited cancellata as a probable synonym of pulchella Defr. This word, I think, is a lapsus for elegans, for Defrance never described a Cypraea pulchella, but at Herrmannsen's time the specific name elegans (the meaning of which is almost the same as pulchella) usually has been connected with the author Defrance indeed, the shell has been described by Defrance (1826, Dict. Sci. nat. Paris, vol. 43, p. 39) as elegans, but it received this name already from Sowerby three years ago (1823, Genera Rec. Foss. Shells, pars Cypraea, fig. 7), ... "

381Cossmann, M., Essais Pal. Comp., 5 liv., p. 169, 1903, *C. elegans* Defrance; Schilder, F. A., 1927, Archiv Naturg. 91, Abt. A., Heft 10, p. 67 *C. elegans* Sowerby.

382Sowerby, G. B., Genera Fos. Sh., *Cypræa*, fig. 7, 1825.

383Boussac, Jean, Minist. Trav. Publics. Mem. La. Cart. Geol. det, France, p. 335, 1911 synonymies of authors therein referred to.

384Personal letter, April 4, 1930.

The shells are truly elegantly sculptured with cancellations. They are so far known only from the Eocene and Oligocene of the world. Schilder in his classification of 1927 placed the genus in the family Pediculariidæ. He had in an earlier writing (Nautilus, XL, No. 1, p. 18,1926) regarded the relationship as with the Triviinæ. His classification of 1932 (Fossilium Catalogus) placed the genus in the Amphiperatidæ.

Cypraædia subcancellata Johnson — Plate 30, fig. 20

Cypræa (*Cypræedia*) *subcancellata* Johnson, 1899, Acad. Nat. Sci. Phila., Proc., vol. 51, p. 78, pl. II, fig. 9.

Cypraedia subcancellata (Johnson) Schilder, 1926, Archiv Naturg., 91, Abt. A. Heft 10, p. 68; Schilder, 1932, Fossilium Catalogus, I, pars 55, p. 209 [partim].

Shell ovate, dorsal surface with 24 prominent revolving ridges, alternated by a smaller one; in the two middle interstices and all the interstices on the base of the shell, the smaller ridges are wanting; the entire shell has also small longitudinal raised lines, that are entirely interrupted by the prominent revolving ridges, lips thickened, having abcut 40 ridges, owing to nearly all of the revolving ridges becoming a uniform size. Length 16 mm., greatest diam. 10 mm.

One specimen collected by the writer from the Lower Claiborne at Smithville, Bastrop Co., Texas.—[Johnson, 1899].

Holotype.—No. 7119, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: Weches formation, Smithville, Texas. (Johnson).

Cypraædia gilberti, new species — Plate 30, figs. 27, 28

Shell large; ventricose; characters typical of *Cypræedia;* surface of the shell completely covered with fine, equal, distinct, transverse ribs with an occasional, microscopic, interculated line; the transverse ribs cut finer, longitudinal lines which give the surface an obscure, cancellated appearance; along the entire length of the columella and outer lip are large, transverse folds; on the columella there is a ridge over which the plaits are slightly protruding, they decrease in size and become continuous with the ribs over the shell; the plaits on the inner margin on the outer lip decrease in size and also become continuous with the body ribs; some of the transverse ribs which begin along the outer margin of the outer lip, appear to be due to divarication; others are of a distinct, separate origin.

This species is of the type of *C. fenestralis* Conrad from the Jackson Eocene and on superficial examination might be classified as such. There is a distinct difference in the sculpture of each so far as a few species reveals. *C. gilberti* is known thus far from a single, beautifully sculptured specimen. It is a large shell for the Eocene Cypræas. The specimen is not so large as the specimens of *C. fenestralis* but the species might attain such dimensions.

The transverse ribs of *gilberti* do not alternate in size, except for microscopic lines, as the ribs do in *fenestralis* and they are more closely spaced in the former species.

The species is named in honor of its discoverer, Prof. Gilbert D. Harris.

Dimensions.—Height, 27 mm., greatest diameter, 20 mm., (broken).

Holotype.—No. 2962, Paleontological Research Institution.

Occurrence.—Gosport sand: locality 104.

Genus SULCOCYPRÆA Conrad, 1865[385]

Genotype by monotypy *S. lintea* Conrad. Upper Eocene and Oligocene. United States.

Sulcocypræa lintea (Conrad) Plate 30, figs. 31, 32

Cypræa lintea Conrad, 1848, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. 1, p. 113, pl. 11, fig. 7; pl. 13, fig. 4; Aldrich, 1886, Bull. Geol. Sur. Ala., vol 1, p. 33, pl. 5, fig. 2; Aldrich, 1894, Nautilus, vol. 7, No. 9, p. 98.

Sulcocypræa lintea Conrad, 1865, p. 31; Schilder, 1927, Archiv Naturg., 91, Abt. A., Heft 10, pp. 81, 133 includes *C. kennedyi* Harris.

Sulcocypraea lintea lintea (Conrad) Schilder, 1932, Fossilium Catalogus, I, Pars 55, p. 223.

Unfortunate errors were contained in the original description of *Cypræa lintea* Conrad, a Jackson Eocene and Vicksburg Oligocene species. Aldrich carefully corrected the description of *lintea* and figured its true character. In 1886, Aldrich figured a specimen like the type and hinted at an incongruity in the original description. Aldrich gave the correction in Nautilus, 1894, stating that the original should read "with *fine* approximate equal impressed lines," instead of "four . . . . . lines". He described *lintea* as having the "surface completely covered with close set, very fine lines". He particularly differentiated *lintea* from *C. healyi* Aldrich[386] (=*dalli* Aldrich) on which the striations do not cover the body of the shell. *C. lintea* is the monotype of *Sulcocy-*

[385]Conrad, T. A., 1865, p. 31.

[386]Aldrich, T. H., Proc. Biol. Soc. Wash., vol. 36, p. 199, 1923 new name, *C. dalli* preoccupied by Cossmann, 1893.

præ, 1865. Aldrich's clarification of the species shows the genus to be superficially of the character of *Cyprædia.* It is difficult to see that "there is no difference between the shells of *"Ovulum concinum"* Ad. Rv., —and— *lintea* Conr.—".[387]

Schilder in his Revision of the Cypræcea of 1927, p. 81, designated *Sulcocypræa* as a distinct genus under which, of the southern United States Eocene Amphiperatidæ, *vaughani, healeyi* (*dalli* Aldrich) *lintea* and *kennedyi* were listed. *Kennedyi* was given as being the equivalent to *lintea.* In 1932, he added *Conradi* =(*dalli* Harris) to the list and separated *kennedyi* from *lintea.*

Sulcocypræa kennedyi (Harris) Plate 30, figs. 29, 30, 33, 34

Cypræa kennedyi Harris, 1895, Acad. Nat. Sci. Phila., Proc., 47, p. 78, pl. 8, fig. 12a.
Sulcocypraea lintea Schilder, 1927, Archiv Naturg., 91, Abt. A, Heft 10, p. 81.
Sulcocypraea kennedyi (Harris) Schilder, 1932, Fossilium Catalogus, I, pars 55, p. 223.

General form and size as indicated by the figures; oral or front surface strongly ribbed transversely, ribs tending to divaricate; mouth moderately wide above, broad submedially and contracted below with one plait-like fold on either side; back smooth except near the margins where there are strong radiating lines.

Locality.—Dr. Collard's farm, Town Branch, Sparks Headright, Brazos Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The species besides being of a different horizon than *S. lintea* differs in having the transverse striations only partially developed over the surface of the shell, in having the posterior canal prolonged more, in having the transverse striations divaricate and in having a deeper columellar groove anteriorly.

Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas. Probably lost.

Occurrence.—Lower Claiborne: locality 707.

Sulcocypræa vaughani (Johnson) Plate 30, figs. 21, 24

Cypræa vaughani Johnson, 1899 Acad. Nat. Sci. Phila., Proc., vol. 51, p. 78, pl. II, fig. 7 non *C. vaughani* Maury, 1912 renamed *Cypraeorbis trinidadensis* by Schilder, 1927.
Eocypræa vaughani (Johnson) Schilder, 1926, p. 363.
Sulcocypræa vaughani (Johnson) Schilder, 1927, Archiv Naturg., 91, Abt. A, Heft 10, p. 81.
Sulcocypræa mathewsonii vaughani Schilder, 1932, Fossilium Catalogus, I, pars 55, p. 222.

[387]Schilder, F. A., The Nautilus, vol. XL, No. 1, July, p. 18, 1926.

Shell small, ovate, globose, smooth, ends slightly prolonged, base rounded, aperture narrowed from the middle toward the posterior, outer lip with 19 and the inner lip with 16 teeth, the latter end abruptly and do not extend within the aperture, as in *Cypræa dalli,* to which it is nearest related, it is also at once separated from the latter by its smaller size.

Length 9 mm., greatest diam. 6 mm.

From the Lower Claiborne at Hammett's Branch, near Mt. Lebanon, La. One specimen.

This species is dedicated to Mr. T. Wayland Vaughan of the U. S. Geological Survey, through whose kindness in giving such explicit information of the Eocene localities of Louisiana I was able to collect this and many other interesting forms.—[Johnson, 1899].

This species is not typical *Sulcocypræa* in that it does not have the revolving ribs over all of the whorl. The species differs from the other described Claibornian Cypræoid forms in the greater prolongation of both canals.

Holotype.—No. 9450, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 730 and 731; Orangeburg District, S. C.

Genus **TRANSOVULA** de Gregorio, 1880[388]

Genotype *T. schefferi* de Gregorio. Eocene. Italy.

Subgenus **OXYCYPRÆA** Schilder, 1927[389]

Genotype by original designation *Ovula delphinoides* Cossmann. Eocene. Paris Basin.

Transovula (Oxcypraea) symmetrica (Aldrich) Plate 30, fig. 22

Ovula symmetrcia Aldrich, 1903, Nautilus, vol. 16, No. 9, p. 99, pl. III, fig. 10.

Shell smooth exteriorly, spire produced, pointed and slightly spatulate, outer lip reflected, margined on the interior with numerous crenulations, and curved from spire to base. Aperture narrow, the inner margin of same denticulated near the spire and with three or four folds at base.

Length of figured example 9 mm.

Localities.—McLeod's Mill and on the banks of the Chickasawhay River, three and a half miles below Quitman, Miss.; close to the Wautubbee beds of the Claibornian. This species differs from both *O. subtruncata* and *O. texana* of Johnson, and it has been kindly compared with the types by C. W. Johnson.

The specimen from the bluff below Quitman is broken, but if perfect would be about 13 mm. in length.—[Aldrich, 1903].

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

[388]de Gregorio, A., Fauna S. Giov. Ilarione, 29, p. 28, pl. 6, fig. 12, 1880.
[389]Schilder, F. A., Senckenbergiana, Bd. 9, Heft 5, p. 207, Frankfurt a. M., Nov. 15, 1927.

Transovula (Oxycypræa) transovuloides (Schilder) Plate 30, fig. 14

Cypræa attenuata Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 78, pl. II, fig. 8 non *C. attenuata* Edwards, 1865.

Cypraea (Jenneria) transovuloides Schilder, 1927, Archiv Naturg., 91, Abt. A, Heft 10, p. 72 new name.

Transovula (Oxycypraea) transovuloides Schilder, 1932, Fossilium, Catalogus, I, Pars 55 p. 224.

Shell elongate, anterior and posterior ends greatly attenuated and curved upward, smooth, with the exception of a few raised, revolving lines at each end, which are almost hidden by the heavy marginal callus, base smooth. Outer lip with 24 and the inner lip with 25 teeth, the central ones of the latter extending for some distance within the aperture. Length 20 mm., greatest diam. 8 mm.

One specimen collected by Mr. Frank Burns from the Lower Claiborne, at Lisbon Bluff, Clarke Co., Ala.—[Johnson, 1899].

Holotype.—No. 8583, Academy of Natural Sciences, Philadelphia, Pa.

Transovula (Oxycypræa) naviculæ new species Plate 30, figs. 15, 23

Shell elongate, both ends attenuate and curved upwards giving the appearance of a skiff; surface of the shell smooth, a few, obscure, revolving lines occur at each end; the lines covered mostly by the heavy, marginal callus; outer lip with 25, elongate teeth which extend the full width of the outer lip; inner lip with 25 teeth of about equal length of those of the outer lip; interior of the anterior region of the whorl, back of the columella protrudes beyond the inner lip.

The last character mentioned is the same as is seen in the illustration of *C. attenuata* Johnson, (=*transovuloides* Schilder.) *T. naviculæ* has the characters as described for *C. attenuata* Johnson. The number of teeth is practically the same and the curvature of the ends with the few, revolving lines are strikingly alike. But unless the illustration by Johnson does not depict the ventral surface correctly the two forms have the posterior canal quite different as well as the general shape. The posterior canal turns to the right and then twists to the left. On *transovuloides* (*attenuate* Johnson) the canal extends straight. In shape *naviculæ* is more constricted at both ends and the bulging of the whorl occurs more at the center. The shells are closely related and there is no doubt but that they belong to the same genus.

Dimensions.—17 mm., length; 7 mm., greatest diameter.

Holotype.—No. 2959, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 725.

Genus NEOSIMNIA Fischer, 1884[390]

Genotype by monotypy *Ovula spelta* Linné. Pleistocene and Recent. Southern Europe.

Neosimnia subtruncata (Johnson) Plate 31, fig. 15

Ovula (*Simnia*) *subtruncata* Johnson, 1899, Acad. Nat. Sci., Phila., Proc. vol. 51, p. 79.

Neosimnia (*Neosimnia*) *subtruncata* (Johnson) Schilder, 1932, Fossilium Catalogus, I, Pars 55, p. 236.

Shell elongate, subtruncate, resembling somewhat the recent *O. uniplicata* Sowerby, of Florida. Smooth with numerous fine revolving lines around the angular or subtruncated posterior, posterior canal extending beyond the truncated portion forming a deep excavation, lip thin, but in a more adult specimen would probably be much thicker. Length 15 mm., greatest diam. 4½ mm.

One specimen collected by the writer from the Lower Claiborne, at Hammetts Branch, near Mt. Lebanon, La.—[Johnson, 1899].

Through Miss Helen Winchester of the Academy of Natural Sciences, Philadelphia, Pa., an illustration of the holotype of this species is included.

Holotype.—No. 9452, Academy of Natural Sciences, Philadelphia.

Neosmnia exana (Johnson) Plate 31, fig. 16

Ovula (*Simnia*) *texana* Johnson, 1899, Acad. Nat. Sci. Phila. Proc., vol. 51, p. 79.

Transovula eugenei texana Schilder, 1932, Fossilium Catalogus, I, Pars 55, p. 224.

Shell narrow, attenuate (anterior part of the shell wanting) resembling in form the recent *O. acicularis* Lam. of the West Indies; dorsal surface of the attenuated portion of the posterior, with fine revolving lines, the remainder of the shell smooth; outer lip thickened, showing a few crenulations toward the anterior, inner lip smooth with a raised callus at the posterior, on which are three or four transverse grooves. Length 11 mm. (its original length was probably about 14 mm.), greatest diam. 4 mm.

One specimen collected by the writer from the Lower Claiborne at ''Alabama Bluff,'' Trinity river, Houston Co., Texas.—[Johnson, 1899].

Miss Helen Winchester of the Academy of Natural Sciences, Philadelphia, Pa., made the included illustration of the holotype of this species.

Holotype.—No. 9208, Academy of Natural Sciences, Philadelphia, Pa.

Family STROMBIDÆ

Genus CALYTRAPHORUS Conrad, 1857[391]

Genotype by subsequent designation, Cossmann, 1904,[392] *Rostellaria velata* Conrad. Eocene. United States.

[390]Fischer, P., Man. de Conch., p. 664, 1884.
[391]Conrad, T. A., Acad. Nat. Sci. Phila., Proc. vol. IX, p. 166, 1857.
[392]Cossmann, M., Essais Pal. Comp., 6 liv., p. 25, 1904.

Calytraphorus velatus (Conrad) Plate 32, figs. 4, 6, 7, 8, 10-13

Rostellaria velata Conrad, 1833, Sept. p. 31; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 38, pl. 15, fig. 5 not 4 [Harris Reprint]; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 356; Conrad, 1855, Acad. Nat. Sci. Phila. Proc., vol. VII, p. 260; Conrad, 1854, Wailes Geol. Miss., pl. 15, fig. 7, Jackson form.; Harris, 1895, p. 47.

Rostellaria Lamarckii Lea, 1833, p. 158, pl. 5, fig. 164.

Calytraphorus velatus Conrad, 1857, Acad. Nat. Sci., Phila., Proc., vol. IX, p. 166; Conrad, 1865, p. 31; Gabb, 1868, Amer. Jour. Conch., vol. IV, p. 142, pl. 13, fig. 9; de Gregorio, 1890, p. 114, pl. 9 figs. 21-30; Aldrich, 1894, Geol. Sur. Ala. p. 245.

Calyptrophorus velatus Conrad, 1866, p. 13; Cossmann, 1904, Essais Pal. Comp., 6 liv., p. 25, pl. III, figs. 1-2.

Rostellaria stamineus Conrad, 1855, Acad. Nat. Sci., Phila., Proc. vol. VII, p. 260; Conrad, 1854, Wailes Agr. and Geol. Miss., Rept. I, pl. 16, fig. 9 high form, Jackson.

Calyptrophorus stamineus Conrad, 1865, p. 31.

Calytraphorus quidest de Gregorio, 1890, p. 115, pl. 10, figs. 1, 2a, b.

Gladium velatus (Conrad) Cossmann, 1893, p. 31.

Shell subfusiform, longitudinally ribbed and transversely striated, but often coated more or less with a smooth, polished calcareous deposit, bounded by a deep groove running upon the spire and returning towards the base, outer lip not expanded; margin thick and reflected. Length 1½ inches.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.

The young and even the adult shells of this singular species are often without the calcareous tunic; sometimes the latter only exists partially, showing the costæ around it; and again the costæ are occasionally wanting, probably from age.—[Conrad, 1833].

Fusiform, with longitudinal curved ribs and spiral striæ, but coated more or less with a smooth polished calcareous deposit, bounded by a deep groove running on the spire and returning towards the base; labrum not expanded; margin thick and reflected; beak and spire prolonged and attenuated.

Locality.—Claiborne, Alab.

Syn. R. Lamarckii, *Lea, Con. p.* 158, *pl.* 5, *f.* 164.

This curious species is very abundant. Young shells are destitute of the tunic and the margin of the labrum is thin and not reflected. No. 3, first ed. p. 31.—[Conrad, 1835].

Nucleus with four, rounded, smooth whorls; immature stage with fine, revolving ribs covering the whole of the whorls of the spire, the interspaces of the ribs are about equal to the width of the ribs; the longitudinal ridges curve convexly toward the suture above and below, cross the revolving lines and form the conspicuous sculpture of the shell; spire high; anterior canal thin, slender, straight and elongated; revolving lines occur over the full surface of the body whorl but the longitudinal ridges die out about midway on the whorl; occasionally an irregular varix is present; posterior canal not present until the adult shell forms the callus covering the entire surface, the canal then extends upward forming a curved channel through the callus, about half the length of the spire and then curves downward for the same distance; callus irregularly thickened on either side of the groove; callus thins in the region between the curves of the posterior canal and the original sculpture of the shell may sometimes be seen; the distinct feature of the adult shell is the spreading of the callus over the entire shell, forming an irregularly polished, smooth surface covering the spire in an elevated apex; the outer lip is rounded, thickened along the margin, constricted anteriorly with a notch; the anterior canal is long, the full length is rarely obtained as most specimens are broken at the notch.

Unfortunately, in the large collection of *C. velatus* from the Gosport sand, none of the specimens have the labrum preserved. To show that particular characteristic Conrad's figure is copied. The most perfect specimens of the species are preserved in the Jackson Eocene sediments.

The species is represented in the Midway Eocene by the variety *compressa* Aldrich.[393] The distinct difference between the Midway variety and the Claiborne form is the character of the posterior termination of the outer lip. This was pointed out by Aldrich and Harris. On *compressus* and *trinodiferus* the Midway and Sabine development of the stock respectively, the labrum is acute posteriorly, deeply emarginate similar to the upper and lower edge of a battle axe. On typical *velatus* of Claiborne and on the Jackson specimens the upper margin of the labrum lacks the deep notch and forms a slope to the general line of the spire. In the Sabine species of the stock, *C. trinodiferus,* (plate 31, figs. 5, 6) the callus makes the peculiar accumulation of three, irregular nodes. The middle node is the largest and is formed in the central part of the back of the shell in the region where the callus is spread thinnest. The other two nodes occur at the beginning and ending of the posterior canal. The canal also spreads over the apex and ends in a tapering snout-like projection. At Bell's Landing, Ala. the species becomes large. An exceedingly interesting development of the stock in the lower Claiborne horizon

[393]Aldrich, T. H., Rept. Geol. Sur. Ala., p. 244, pl. 12, figs. 2, 2a, 2b, 1894; Harris, G. D., Bull. Amer. Pal., vol. 1, No. 4, p. 104, pl. 10, figs. 7, a, b, 8, 1896.

occurs at Hammett's Branch, La. The form is described under the name *nodovelatus*, n. var.

Typical *velatus* occurs in the lower Claiborne and in the Gosport sand and continues its existence into Jackson time as is seen by the abundant specimens from the Mississippi and Louisianna localities. The most perfect preserved specimens are from localities from these states particularly at Gibson's Landing, La. The Jackson shells seem to develop more irregular varices than occur on the specimens from Claiborne. The number of longitudinal ribs is not a constant character at any stage of the development of the stock. They may vary from 18 to 29.

Calyptraphorus as known in the southern basin is restricted to the Eocene, Midway through Jackson. Stanton[394] named fragments of specimens *Calytraphorus septentrionalis* from the Cannonball member of the Lance formation in North Dakota of indefinite Cretaceous-Eocene age. The true character of those stromboid forms will remain in doubt until more perfect specimens are found. The Indian Cretaceous shells of Stoliczka[395] *R. palliata* Forbes have long been referred to *Calyptraphorus*.

The callus spreads over the shell in the Indian Cretaceous species as in the American Eocene but the restoration of the anterior canal by Stoliczka is not that of typical *Calyptraphorus*. Since the specimens were broken at or above the beginning of the canal the restored parts may not represent the true condition.

Axel Olsson found fragments of *Calyptraphorus* in the upper Cretaceous of Peru[396].

In the lower Eocene, *Calyptraphorus* of the *velatus* stock was widely distributed in the Americas extending from the Rio Maria Farinha region, Brazil[397] through Soldado Rock, Gulf of Paria[398] to the southern United States.

[394]Stanton, T., U. S. Geol. Sur., Prof. Paper, 128A, p. 39, pl. 7, figs. 5a-d, 6, 1921.

[395]Stoliczka, F., 1867, vol. V, pts. 1-4, pp. 24, 34, pl. II, figs. 18-20; Gabb, W., Proc. Amer. Phil., Soc., VIII, p. 98, 1861; Gabb, W., Amer. Jour. Conch., vol. IV, p. 142, 1868.

[396]Olsson A., Bull. Amer. Pal., vol. XX, No. 69, p. 68, pl. 10, fig. 2,, 1934. *C. hopkinsi* Olsson.

[397]White, C. A., Arch. Museu Nac. Rio de Janeiro, vol. VII, pp. 174, 175, pl. XI, figs. 17-19, 1887; Maury, C. J., Acad. Nat. Sci. Phila., Jour. 2d. ser. vol. XV, p. 87, 1912 *C. velatus chelonites*.

[398]Maury, C. J., ibid, p. 88, pl. XIII, figs. 8-10 *C. velatus compressus*.

C. jacksoni Clark[399] occurs in the Aquia formation, Sabine Eocene of Maryland. *C. trinodiferus* and *C. velatus* occur in the lower Sabine and Claibornian of Virginia[400].

Two new species of *Calyptraphorus, C. aldrichi* and *C. popenoe* have recently been described by Dr. Julia Gardner[401] from the Midway of Texas.

Dimensions.—Height, 52 mm.; greatest diameter, 19 mm., lectotype. Height, 50 mm.; greatest diameter, 19 mm., lectotype *R. Lamarcki* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5821, A. N. S., holotype, *R. Lamarcki* Lea.

Occurrence.—Lower Claiborne: localities 732, 734, 747, 758, 778 and 803. Gosport sand: locality 104 (type).

Calytraphorus velatus nodovelatus, new variety Plate 32, figs. 1-3, 5, 9

General characters of *C. velatus;* a medium sized, irregular node such as in *trinodiferus* occurs near the beginning of the posterior canal, at the lower left part of the area of thin callus; an elongated node occurs in the opposite right side of the thin spot; nodes irregular in size also occur on opposite sides of the body whorl as in *trinodiferus;* several varices occur on the immature shell.

Superficially the shells would be taken for *trinodiferus* and have as certain museum labels indicate. The upper angle of the labrum reveals the shell to be distinctly related to *velatus.* The slope of the lip is like *velatus* and does not have the acute notch as in *compressus* and *trinodiferus.* But the difference in the position of the mid-node as well as the character of the outer lip marks the form as distinct from the Sabine species. The specimens so far found occur only at Hammett's Branch, La., in the lower Claiborne. The shells are extremely interesting in having a combination of characters of both *C. velatus* and *C. trinodiferus,* suggesting that the species belong probably to the same stock.

Dimensions.—Height, about 39 mm.; greatest diameter, 18 mm.

[399]Clark, W. B., U. S. G. S., No. 141, p. 68, pl. XII, figs. 2a, b, 1896; Md. Geol. Sur. Eocene, p. 145, pl. XXV, figs. 1, 1a, 2, 1901.

[400]Van Winkle, K. V., Bull. Amer. Pal., vol. VIII, No. 33, p. 11, 1919.

[401]Gardner, Julia, Univ. Texas Bull. No. 3301, pp. 268-270, pl. 24, figs. 1-3, 4, 6-8, May, 1935.

Syntypes.—Nos. 2973, 2974, 2975 and 2976, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 730.

Genus **ECTINOCHILUS** Cossmann, 1889[402]

Genotype by original designation *Strombus canalis* Lamarck. Eocene. Paris Basin.

Ectinochilus laqueatus (Conrad) Plate 33, figs. 1, 2, 5-7

Rostellaria laqueata Conrad, 1833, p. 41; Conrad, 1834, App., in Morton, p. 6; Conrad, 1835, p. 38, pl. 15, figs. 4 not 5; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 356.

Rimella laqueata Conrad, 1857, Acad. Nat. Sci. Phila., vol. IX, p. 166; Conrad, 1865. p. 31; Conrad, 1866, p. 13; Cossmann, 1893, p. 31; Harris, 1895, p. 23; Aldrich, 1894, Geol. Sur. Ala., p. 244.

Rostellaria Cuvieri Lea, 1833, p. 160, pl. 5, fig. 165; H. C. Lea, 1848, p 105.

Strombus canalis de Gregorio, 1890, p. 113, pl. 9, figs. 16-19.

Ectinochilus laqueatus (Conrad) Cossmann, 1904, Essais Pal. Comp., 6 liv., p. 42; Stewart, 1926, p. 367.

Subulate, with acute longitudinal ribs, and fine spiral striæ; base coarsely striated.

Obs. I at first thought this might be the young of *R. velata,* (nobis) but a comparison of many specimens proves it entirely distinct.—[Conrad, 1833].

Subfusiform, with acute longitudinal slightly curved plicæ on the superior half of each whorl; whorls slightly convex, with fine spiral striæ; labium thickened and reflected, the callus continued on the spire; labrum thick, margin acute, biaugulated inferiorly; base with strong spiral striæ; truncated.

Syn. R. Cuvieri, *Lea, Con. p.* 160, *pl.* 5, *f.* 165.

Locality. Claiborne, Alab.

This species is very abundant. No. 4, first ed. p. 41.—[Conrad, 1835].

Nucleus consists of two and a half or three, smooth whorls; post-nuclear whorls sculptured with numerous, small, longitudinal ribs which extend the height of each whorl on the young shell except that of the penultimate whorl and the body whorl; on adult shells the longitudinal ribs tend to die out on the lower portion of the older whorls of the spire; underlying the radiating ribs are obscure, transverse lines; on the lower part of the body whorl, the lines become fairly well developed ridges; the longitudinal ribs and transverse lines are well developed on the body whorl just back of the labrum, but the sculpture dies out on the front of the whorl until the upper and middle part of the shell above the columella is smooth; a secondary notch on the outer lip frequently occurs a short distance above the siphonal notch.

This species is certainly the analogue of *E. canalis* (Lamarck) of the Lutetian of the Paris Basin with which it has been placed

[402]Cossmann, M., 1889, p. 87.

synonymously by authors. The secondary notch which occasionally occurs in *laqueatus* is found more frequently in *canalis*. *E. canalis* may be distinguished by the presence of obscure varices. A varix has not been observed on specimens of *laqueatus* but there is the possibility that the species may possess varices. The writer agrees with Stewart (1926, pp. 367, 368) that the presence or absence of varices is not a good character by which to separate the genera of this family.

A varietal form of *E. laqueatus* occurs in the Jackson Eocene. The parent species becomes modified in ornamentation, the spiral lines cover the whole surface of the shell. The smoothest portions of the shell are the apical whorls. The spiral lines gain in strength on the younger whorls. The longitudinal ribs, which form the predominate character of the spire of young *laqueatus* s. s., on the Jackson specimens do not develop until on the penultimate whorl and then sometimes obscurely. They usually occur over the upper part of the body whorl on the Jackson shells. The secondary notch on the labrum occurs about as frequently in both forms. In shape the two are alike and both lack the varices. They seem to be of the same stock.

Dimensions.—Height 38 mm.; greatest diameter, 16 mm.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; lectotype, *R. cuvieri* Lea, No. 5829, A. N. S.

Occurrence.—Gosport sand: locality 104.

Ectinochilus texanus (Harris) Plate 33, fig. 3

Rimella texana Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 78, pl. 9, fig. 1.

Ectinochilus (*Macilentos*) *texanus* (Harris) Stewart, 1926, p. 367, section *Vaderos*.

Size and general form as indicated by the figure; whorls 11; 1 exceedingly small, smooth; 2, 3, 4, 5, smooth and polished; 6, 7 faintly and finely cancellated; 8 with small longitudinal plicæ crossed by minute spiral striæ; 9, 10 more strongly plicate longitudinally, plicæ most strongly developed midway of the whorls; body whorl plicate superiorly though not immediately below the suture; spiral striæ very fine over the plicæ but coarse above and very fine over the plicæ but coarse above and very coarse below; outer lip acute below, thick and reflected above, medially forming a right angle; inner lip well defined, uniting with the outer above and forming a canal that passes up the spire rather more than half-way to the apex, recurving descends the width of a whorl or two; columella long and pointed, deflected backward.

Localities.—Colorado River, Devil's Eye, Bastrop Co.; Brazos River, about one mile below the Milam-Burleson County line; Mosley's Ferry (Singley's collection); Collier's Ferry, Burleson Co., Tex.

Geological horizon.—Lower Claiborne Eocene.
Type.—Texas State Museum.—[Harris, 1895].

This species may belong in the subgenus *Vaderos* Clark and Palmer[403] but the long inner lip deflected backward distinguishes the species from typical *Ectinochilus* as well as from the groups segregated by Clark and Palmer.

Dimensions.—Height, 37 mm.; holotype.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 725, 730, 741 and 775.

Ectinochilus texanus planus (Harris) Plate 33, fig. 4

Rimella texana var. *plana* Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 78, pl. 9, fig. 2.

In this form, which is probably only a variety of the foregoing, the posterior canal extends nearly or quite to the apex of the spire, and recurving descends to near the body whorl. The only ornamentation is the spiral striation at the base of the body whorl, and sometimes faint costæ near the apex.

Localities.—Two miles east of Alto, Cherokee Co.; near McBee Schoolhouse, Cherokee Co.; Collier's Ferry, Brazos River; 2 miles west of Alto, Cherokee Co.; Sulphur Springs, Rusk Co.; Robbins' well, Houston Co., Tex.
Geological horizon.—Lower Claiborne Eocene.
Type.—Texas State Museum.—[Harris, 1895].

This variety, separated from *texanus* s. s., by the greater extension posteriorly of the posterior canal would more naturally belong in the subgenus *Macilentos* Clark and Palmer.[404] The amount of the sculpture as pointed out by Clark and Palmer seems hardly to be a good criterion to differentiate subgeneric groups in Stromboid genera.

Dimensions.—Height, 34 mm., holotype.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 767.

Genus **LEIORHINUS** Gabb, 1860[405]

Genotype by monotypy *Fusus proruptus* Conrad (=*L. crassilabris* Gabb). Eocene. United States.

[403]Clark, B. L. and Palmer, D. K., Univ. Cal. Pub. Geol. Sci., Bull., vol. IV, No. 7, p. 281, 1923.
[404]Clark, B. L. and Palmer, D. B., ibid, p. 282, 1923.
[405]Gabb, W. M., Acad. Nat. Sci. Phila., 2d. ser. Jour. vol. IV, p. 401, 1860.

Leiorhinus prorutus (Conrad) Plate 31, figs. 1-3, 13; Plate 84, figs. 2, 9

Fusus prorutus Conrad, 1833, Nov., p. 43; H. C. Lea, 1848, p. 100.
Fusus parvus Lea, 1833, Dec., p. 151, pl. 5, fig. 157; H. C. Lea, 1848, p. 100.
Fusus minor Lea, 1833, p. 151, pl. 5, fig. 158; H. C. Lea, 1848, p. 100.
Pleurotoma proruta Conrad, 1835, p. 51, pl. 17, fig. 15; d'Orbigny, 1850, p. 360.
Leiorhinus crassilabris Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser. Jour., vol. IV, p. 402, pl. 67, fig. 60.
Leiorhynus proruta Conrad, 1865, p. 30; Conrad, 1866; p. 13; Cossmann, 1893, p. 31, [Spelled *Liorhynus*].
Strombus (*Leiorhynus*) *prorutus* (Conrad) de Gregorio, 1890, p. 114, pl. 9, fig. 20.
Fusus (*Bulbifusus*) *minor* (Lea) de Gregorio, 1890, p. 88.

Fusiform, smooth, with seven volutions, a little convex, and with an indented line immediately below the suture; spire longer than the beak, which is striated at the base; aperture more than half the length the shell; labrum striated within.—[Conrad, 1833].

Fusiform, smooth; whorls convex, with a submarginal impressed line; body whorl ventricose; submargin of the labrum with a slight oblique varix; labrum emarginate near the base.

Locality.—Claiborne, Alab.

Allied to *P. prisca*, Sow. I formerly referred it to *Fusus*, but having examined more perfect specimens, I find it possesses the emarginate labrum. —[Conrad].

On mature specimens a slight tooth is developed on the inner lip opposite the emargination of the outer lip. The *Fusus parvus* and *minor* of Lea are young shells of the species. Meyer drawings of the lectotypes are included herein.

On shells of imaturity, the tooth on the inner lip and the margination of the outer lip are lacking. The anterior canal may be reflected in the early stages.

Dimensions.—Height, 21 mm.; greatest diameter, 12 mm., lectotype. Height, 10 mm.; greatest diameter, 6 mm., lectotype *Fusus parvus* Lea. Height, 7 mm.; greatest diameter, 4 mm., lectotype, *Fusus minor* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5800, A. N. S., lectotype *Fusus parvus* Lea. No. 5801, A. N. S., lectotype, *Fusus minor* Lea.

Occurrence.—Gosport sand: locality 104.

Nomen nudum

Rimella stephensoni Stenzel in Renick and Stenzel, 1931, Univ. Texas, Bull. No. 3101, p. 102; Plummer, 1933, Univ. Texas Bull., No. 3232, vol. 1, pt. 3, p. 663 is as yet a nomen nudum.

Family CASSIDIDÆ

Genus PHALIUM Link, 1807[406]

(*Bezoardica* Schumacher, 1817)

Genotype by subsequent designation, Herrmannsen, 1852,[407] *Cassis glauca* Linnæus. Recent. Indo-Pacific.

Phalium brevicostatum (Conrad) Plate 31, figs. 4, 9-11; Plate 83, fig. 9

Cassis brevicostatus Conrad, 1834, Acad. Nat. Sci. Phila., Jour. vol. VII, p. 146; Conrad, 1834, App. in Morton, p. 5; H, C. Lea, 1848, p. 98; d'Orbigny, 1850, p. 370.

Semicassis brevicostata Conrad, 1865, p. 25; Conrad, 1866, p. 15.

Cassis brevicostatus (Conrad) de Gregorio, 1890, p. 99; Cossmann, 1893, p. 32; Harris, 1895, p. 8 non Dall's fig. 6.

Cassis (*Phalium*) *globosum* Dall, 1890, p. 161; Dall, 1892, p. 262 [partim], pl. 20, fig. 11 non fig. 6; fig. 11 error in locality.

Cassis (*Sconsia*) *brevicostata* (Conrad) Pilsbry, 1922, Acad. Nat. Sci., Phila., vol. 73, p. 362.

"*Cassis*" *brevicostata* Wrigley, 1934, Mal. Soc. Lond., Proc., vol. XXI, pt. II, p. 115.

Shell elliptical; volutions indented above, and with narrow oblique tuberculated costæ, which on the body whorl abruptly terminate above the middle; spiral striæ fine, lines of growth prominent; labium thickened; margin subacute; within with short prominent striæ; labium striated above and beneath. Length, three-fourths of an inch.

Locality.—Claiborne, Alabama.

Allied to *C. nuperus*, nobis. [Conrad, 1834].

Nucleus consists of four, smooth, globose whorls; apex flattened and minute; fourth greatly enlarged; sculpture of the postnuclear whorls begins abruptly and includes the complete characters at its initiation; varices rare, occur irregularly; siphonal notch recurved.

This species is fairly abundant in the beds of lower Claibornian formations. Conrad described the species from Claiborne, Alabama. Dall described a *Phalium globosum* in 1890, from the localities near Newton, Miss. and from the Ocala limestone, Richard's quarry in Florida, unaware of a similar unfigured species by Conrad. Aldrich called Dall's attention to the Conradian species. Dall made note of this in 1892 but he considered Conrad's description of the form too inadequate. In addition since Conrad's species was unfigured, Dall believed his own might stand. The lectotype of *brevicostatum* is a perfect specimen at the Philadelphia Academy of Sciences. There is an excellent

[406]Link, H. F., 1807, p. 112.
[407]Herrmannsen, A. N., 1852, p. 104; Dall, W. H., 1909, pp. 61, 62.

drawing in the Aldrich collection by Meyer, so that a thorough comparison has been made of *P. brevicostatum* and *P. globosum*. The Meyer drawing is included in this report. Dall figured specimens of *P. globosum* in 1892, in his monumental Wagner paper, pl. XX, figs. 6 and 11. Figure 6 was labelled from the Ocala limestone and fig. 11 labelled from the "Chipola Beds". The specimen figured from the "Chipola" is a typical Eocene *brevicostatum* but the specimen of fig. 6 is distinct from fig. 11. Dall[408] referred to specimens to the species in 1916, from the Flint River Oligocene and still considered the Eocene to Miocene forms as the same. Cook[409] later revised the identification of the Georgian material to be that of *Cassis cœlatura* Conrad. He did not list *globosum* as occurring in the Vicksburg group as Dall[410] had done in 1903 and which Cooke[411] reviewed in 1915.

In studying the figures of Dall's *globosum* the identification of the two figures of Dall's was queried as to their being the same species and that one (fig. 11) came from the Chipola Miocene. Such doubt of the status of the species as given by Dall was justified by an examination of the type material at the United States National Museum in Washington, D. C.

Type specimen of pl. XX, fig. 6, is No. 112205 (see the synonyny for the reference), was found to be a gutta percha cast from a mold from Richard's quarry, Florida, Ocala limestone. The figure by Dall is a good representation of the specimen. The specimen is not the same as that of pl. XX, fig. 11, which is included in *P. globosum* but which is *brevicostatum*. Therefore separating the specimen of fig. 11 from *P. globosum* Dall, I select No. 112205, U. S. Nat. Mus. specimen, as the lectotype of *Phalium globosum* Dall. This limits the species as known so far to the Ocala limestone.

The specimen illustrated by fig. 11, pl. XX, Wagnerian Report, vol. 3, pt. II, is from material No. 112203, two and one half miles

[408]Dall, Wm. H., U. S. Nat. Mus., Proc., vol. 51, No. 2162, p. 508, 1916.
[409]Cooke, C. W., U. S. Geol. Sur. Prof. Paper, No. 133, p. 6, 1923.
[410]Dall, Wm. H., Trans. Wag. Free Inst. Sci., Phila., vol. III, pt. 6, p. 1557, 1903.
[411]Cooke, C. W., U. S. Geol. Sur., Prof. Paper, No. 95-I, p. 111, 1915.

east of Newton, Miss. The best and only complete specimen is stated to be the type. This specimen is the one figured as fig. 11, pl. XX. In the explanation of the plate, p. 456 of the same report, the specimen is stated to be from Chipola. This must be a mistake on Dall's part. His original description gives the material from Newton and the Ocala. He later repeated the Chipola Miocene age. The catologue[412] of type specimens in the U. S. National Museum, gives the locality of No. 112203, as from Newton, Miss. It however omits the Ocala locality of the fig. 6. Undoubtedly the specimen of fig. 11, No. 112203 should be corrected to read *Phalium brevicostatum* Conrad, east of Newton, Miss., Clabornian Eocene. The specimens in the Harris collection of *Phalium brevicostatum* which are perfect and like Dall's specimen are from the same horizon as Newton, Miss., the localities of Wautubbee and Hickory, Miss.

To clarify rather than add further confusion to the identity of *Phalium globosum* Dall, a summary of the discussion of the species is given:

I. *Phalium brevicostatum* Conrad, 1834. Claibornian Eocene. Includes part of *Phalium globosum* Dall, 1890, p. 161, Newton, Miss.; Dall, 1892, pl. XX, fig. 11 incorrectly labelled from Chipola.

II. *Phalium globosum* Dall, 1890, p. 161, Richard's Quarry, Ocala limestone only; Dall, 1892, pl. XX, fig. 6. Lectotype 112205, U. S. Nat. Mus.

III. *Phalium globosum* under 112203, p. 499, Bull. 53, U. S. Nat. Mus. should read *Phalium brevicostatum* Conrad and fig. 6, in the reference should be omitted.

IV. *Phalium globosum* Dall in the same catalogue should read No. 112205. Holotype. Richard's Quarry, Florida. Ocala limestone. The reference as given should include fig. 6 only.

V. Material was not found in the U. S. Nat. Mus. to confirm the Miocene distribution of either *P. brevicostatum* or *globosum* so far as finding material which Dall had identified as such.

The Eocene distribution of *Phalium* in the southern Eocene is interesting and important in the occurrence of the group since

[412]Schubert, C. and others, U. S. Nat. Mus., Bull. 53, pt. I, p. 499, 1905.

on the Pacific Coast of North America the genus does not occur until the Oligocene[413].

Dimensions.—Height, 20 mm.; greatest diameter, 13 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 724, 726, 728, 729, 731, 733, 741, 773 and 803. East of Newton Miss. (Dall). Claiborne, Ala. (Conrad) Horizon?

Phalium Taitii (Conrad) Plate 83, fig. 10

Cassis Taitii Conrad, 1834, Acad. Nat. Sci. Phila., Jour. vol. VII, p. 145; Conrad, 1834, App. in Morton.; p. 5; H. C. Lea, 1848, p. 98; d'Orbigny, 1850, p. 370; Harris, 1895, p. 44; de Gregorio, 1890, p. 100, sp. dub.; Pilsbry, 1922, Acad. Nat. Sci. Phila., vol. 73, p. 362.
Semicassis Taitii Conrad, 1865, p. 26.
Cassis Taitii? Aldrich, 1886, Geol. Sur. Ala., Bull. 1, p. 47, Lisbon.
Cassis (*Phalium*) *taitii* (Conrad) Johnson, 1899, Acad. Nat. Sci. Phila., Proc. 51, p. 77, pl. II, fig. 5.

Shell suboval, with about eight series of prominent nodes on the body whorl; summit of the whorls flattened, and with a prominent line near the suture; intervals between the costæ with a few spiral striæ; apex slightly papillated; labrum widely reflected, dentate on the inner margin; labium with three or four prominent striæ at base. Length, one inch and three-fourths; breadth, one inch and one-fourth.

Locality.—Claiborne, Alabama.

I dedicate this beautiful species to my kind friend, Judge Tait, of Claiborne, whose love of science first brought into notice the rich deposits of fossils near the town in which he resides.—[Conrad, 1834].

This species was not figured by Conrad. It has not been found at Claiborne, since Conrad. The Meyer drawing of the holotype is included in this report.

Mr. Chas. Johnson figured a restored specimen from Jackson, Eocene.

The figure of the species shows it to be a typical *Phalium.*

Dimensions.—Height, 42 mm.; greatest diameter, 31 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Claiborne, Ala. (Conrad) Jackson Eocene: Jackson, Miss.; Montgomery, La. (Johnson).

Genus **GALEODEA** Link, 1807[414]

(*Cassidaria* Lamarck 1822)

Genotype by monotypy *G. echinophora* (Linnæus). Recent. Mediterranean.

[413]Schenck, H. G., Univ. Cal. Pub. Geol., Bull., vol. 16, No. 4, p. 73, 1926.
[414]Link, H. F., 1807, p. 113.

Galeodea planotecta Meyer and Aldrich Plate 31, figs. 14, 17

Cassidaria planotecta Meyer and Aldrich, 1885, Cincinnati Soc. Nat. Hist. Jour., vol. VIII, July, p. 43, pl. II, fig. 14.

Morio planotecta Johnson, 1899, Acad. Nat. Sci., Phila., Proc. vol. 51, p. 77, pl. 1, fig. 12.

Spire very much flattened. Three and a half embryonic whorls form a subglobular nucleus. Adult whorls four. Body whorl with two carinas, the upper one carrying subspines. Surface covered with rather distant, elevated, revolving lines. Inner lip spread over the body whorl. Columella irregularly tuberculated.

Newton.

The figure on the plate, though still representing a fragment, is restored from two specimens. The form is characterized by its flat spire.—[Meyer and Aldrich, 1885].

The specimens are found in fragments at all of the numerous localities at which the species occurs. At some localities they occur as casts and molds and may be recognized by the flattened spire and bicarinated body whorl. Old specimens have both carinæ spinose and the outer lip is extremely thickened. There is one, large tooth above on the outer lip and a series of small teeth medially and below on the same lip. The callus, siphonal fasciole and the anterior canal are as in the type of the genus.

There are thirteen nodes on the posterior carina of the body whorl of a syntype.

Several species of *Galeodea*[415] occur in the Eocene of the Pacific Coast of North America.

Mr. Johnson figured a specimen of the species from the Jackson Eocene, of Jackson, Miss.

Dimensions.—Greatest diameter, 22 mm., (average).

Syntypes.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 724, 725, 726, 728, 729, 733, 741, 743, 756, 775 and 831. Jackson Eocene: Jackson, Miss. (Johnson).

Galeodea dubia (Aldrich) Plate 31, figs. 7, 8

Cassidaria dubia Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour., p. 153, pl. 3, fig. 21; Aldrich, 1886, Geol. Sur. Ala., Bull. I, p. 33, pl. 1, fig. 21; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11 p. 68; Wrigley, 1934, Mal. Soc. Lond. Proc., vol. XXI, pt. II, p. 128 [?=*brevidentata* Ald.].

[415]Schenck, H. G., Univ. Cal. Pub. Bull., vol. 16, No. 4, p. 81, 1926; Tegland, N. M., Univ. Cal. Pul. Geol., Bull. vol. 19, No. 18, 1931.

Specimens of this Sabine species have not been found in the present Claibornian Eocene collections. Prof. G. D. Harris, in his Texas manuscript report, identified specimens from the lower Claiborne Collier's Ferry (Burleson Shell Bluff), Burleson County, Texas as the species. The species is not adequately known since the type and subsequent Sabine material was imperfect.

Genus **SCONSIA** Gray, 1847[416]

Genotype by original designation *Cassidaria striata* Lamarck. Recent. West Indies.

Subgenus **DOLIOCASSIS** Dall, 1909.[417]

Genotype by original designation, *Buccinum sowerbii* Lea= *Cassis nuperus* Conrad. Eocene. United States.

Sconsia (Doliocassis) nupera (Conrad)

Plate 31, figs. 12-18; Plate 83, figs. 7, 11

Cassis nuperus Conrad, 1833, Nov., p. 46; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 98; d'Orbigny, 1850, p. 370; Harris, 1895, p. 30.
Buccinum Sowerbii Lea, 1833, Dec., p. 164, pl. 5, fig. 169.
Semicassis nupera Conrad, 1865, p. 26; Conrad, 1866, p. 15; Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 128 section *Casmaria* H. and A. Adams.
Semicassis Sowerbii (Lea) Conrad, 1865, p. 26; Conrad, 1866, p. 15; Cossmann, 1893, p. 32.
Cassis Sowerby (Lea) de Gregorio, 1890, p. 99, pl. 7, figs. 49, 50a, b.
Doliocassis Sowerby (Lea) Dall, 1909, p. 62; Cossmann, 1912, Essais Pal. Comp., 9 liv., p. 159; Wrigley, 1934, Mal. Soc. Lond., Proc. vol. XXI, pt. II, p. 109.
Sconsia nupera (Conrad) Pilsbry, 1922, Acad. Nat. Sci. Phila., Proc., vol. 73, p. 362; Wrigley, 1934, Mal. Soc. Lond., Proc., vol. XXI, pt. II, pp. 115, 129.
Sconsia (*Galeodosconsia*) *nupera* (Conrad) Woodring, 1928, p. 308.

Subglobose, with spiral impressed striæ, and fine longitudinal lines; whorls of the apex convex, and cancellated; columella with prominent transverse lines, obsolete in the center; labrum thickened with irregular prominent lines on the submargin.—[Conrad, 1833].

Nucleus consists of four, smooth, globose whorls, apex minute and flattened; the spiral striations begin gradually on the fourth whorl.

The species occurs abundantly in the Gosport sand and the collection affords a beautiful suite of specimens in all stages of growth. Obscure, flattened varices occur occasionally. Some individuals show a tendency to develop minute nodes on the shoulder of the body whorl.

[416]Gray, J. E., 1847, p. 137.
[417]Dall, W. H., 1909, p. 62.

Dr. Pilsbry[418] was the first to point out the affinities of this species with *Sconsia* as well as with *Phalium brevicostatum* of the mid-Eocene. Woodring suggested that *nupera* and the Miocene *Hodgei* (Conrad) do not represent the identical characters of *Sconsia* and should be placed in the subgenus *Galeodosconsia* Sacco[419]. Dr. Dall made a new subgenus *Doliocassis* to include *S. sowerbii* Lea in 1909. *S. nupera* (Conrad=(*S. sowerbii* Lea) has a nucleus like that of *Phalium brevicostatus* and not like that of *Sconsia.* Dr. Pilsbry's outline of the relationships of the species is the most consistent of those suggested. The form resembles the type of *Galeodosconsia* as figured by Cossmann with the exception of the siphonal fasciole. The area is rarely open in *S. nupera* and is conspicuously convex, inflated and the callus absorbed into the surface over the notch. On *G. striatula* (Bonelli) there seems to be a slight concave fasciole. *S. nupera* is strikingly different from the related species by its lack of heavy parietal and columellar calli. The fasciole appears more like *Phalium.*

The stock of *S. nupera* has probably continued through to the Miocene on the East Coast of America and is represented in the Duplin Miocene of North Carolina by *S. Hodgei* (Conrad)[420].

The specific development differs in the Miocene by loss of some of the convexity of the siphonal fasciole, by a narrowing of the concentric ribs and the attaining of a larger size.

Conrad did not figure *S. nupera* and strangely he did not see the identity of his species and *S. sowerbii* Lea for in both of his catalogues, 1865 and 1866, he listed the species as distinct. The types of both names have been examined and they represent the same species.

The Conrad type material consists of 10 specimens on a card. The upper middle specimen is selected as the lectotype.

Dimensions.—Height, 28 mm.; greatest diameter, 17 mm., lec-

418Pilsbry, H. A., Acad. Nat. Sci. Phila., Proc. vol. 73, p. 362, 1922.

419Sacco, F., Boll. Mus. Zool. Anat. Comp. R. Univ. Torino, vol. 5, No. 82, p. 17, 1890. Type by subsequent designation, Cossmann, 1903, *Cassidaria striatula* Bonelli. Miocene. Italy.

420Conrad, T. A., Amer. Jour. Sci., vol. XLI, No. 1, p. 346, 1841 as *Cassis.*

totype; height, 18 mm.; greatest diameter, 9 mm., holotype *B. sowerbii* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5837, A. N. S., lectotype *B. sowerbii* Lea.

Occurrence.—Gosport sand: Claiborne, Ala. (loc. Nos. 104 and 782).

Family **FICIDÆ** (Pyrulidæ)

Genus **FICUS** (Bolten) Roeding, 1798.[421]

Pyrula Lamarck, 1799).

Genotype by subsequent designation, Dall[422], 1906 *Bulla ficus* Gmelin. Living. Indo-Pacific.

Ficus affinis Van Winkle — Plate 34, figs. 12, 13

Ficus affnis Van Winkle, 1919, Bull. Amer. Pal., vol. VIII, No. 33, p. 8, pl. 1, fig. 10, a.

This species is known only from molds and therefore some doubt is held as to its strict generic placement. The shape is that of *Ficus* and from the low spire and few whorls, the nucleus would be limited probably to one to two whorls. Such a character would be characteristic of *Ficus* rather than *Ficopsis.*

As found so far, *Ficus* was not a common genus in the eastern mid-Eocene. Two species of *Ficopsis* occur.

Dimensions.—Height, 17 mm.

Holotype.—No. 1398, Paleontological Research Institution.

Occurrence.—Lower Claiborne: James River, just below City Point, Va. (type).

Genus **FICOPSIS** Conrad, 1866.[423]

Genotype by subsequent designation, Stewart, 1926[424] *"Hemifusus" remondii* Gabb. Eocene. California.

Ficopsis penita (Conrad) — Plate 33, figs. 8-15

Pyrula penita Conrad, 1833, Aug., p. 32; Conrad, 1834, App. in Morton, p. 6; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 363; Harris, 1895, p. 33; Wrigley, 1929, Mal. Soc. Lond., Proc., vol. XVIII, pp. 247, 249, pl. 16, fig. 19 as *Ficus.*

Pyrula tricarinata Conrad, 1835, p. 38, pl. 15, fig. 6 non Lamarck.

Pyrula cancellata Lea, 1833, p. 154, pl. 5, fig. 160; H. C. Lea, 1848, p. 105.

Pyrula elegantissima Lea, 1833, p. 155, pl. 5, fig. 161; H. C. Lea, 1848, p. 105; d'Orbigny, 1850, p. 363.

Sycotypus penita Conrad, 1857, Acad. Nat. Sci. Phila., Proc. vol. 7, p. 31; Conrad, 1865, p. 26.

Ficopsis penitus Conrad, 1866, p. 15.

[421] Bolten, J. F., Roeding, P. F., 1798, p. 148.
[422] Dall, W. H., 1906, p. 296.
[423] Conrad, T. A., Amer. Jour. Conch., vol. II, p. 100, 1866.
[424] Stewart, R. B., 1926, p. 375.

Ficula nexilis de Gregorio, 1890, p. 101, pl. 7, figs. 57-59 [partim] non Lamarck.
Pyrula nexilis Heilprin, 1891, p. 399 non Lamarck.
Pirula cancellata Cossmann, 1893, p. 31; Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 142.

Shell subfusiform, reticulated, with three carinations on the body whorl; striæ alternating in size; five volutions; spire elevated and pointed. Lip thickened towards the margin.

Variety, C. Destitute of carinations, and probably the young shell. Length about an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Subfusiform; reticulated; tricarinated; spire elevated and pointed; base produced, attenuated; labrum thickened on the submargin within.

Var. A. Not carinated.

Syn. P. penita, *nob*. No. 3, *first ed*. p. 32.
P. cancellata, *Lea*, *Con*. *p*. 154 *pl*. 5, *f*. 160.
P. elegantissima, *ibid*, *pl*. 5, *f*. 161.

Locality.—Claiborne, Alab.

This shell agrees so well with the *tricarinata*, Lam. as figured in Sowerby's Genera of Shells, that I here refer it to that species, a fossil of the *Calcaire grossier*. That the variety is not distinct I am assured by the comparison of many specimens.—[Conrad, 1835].

Nucleus consists of three, smooth, flattened whorls; post-nuclear whorls begin with complete, reticulated structure; commonly numerous, irregular pustules or granules occur on the last of the nucleus.

The tricarination of the body whorl is neither worth varietal rank nor is it a question of age of the individual. Young specimens of the same size may show the tricarinated and non-tricarinated character respectively. Specimens have been figured to show this feature. A large collection of shells includes specimens with a strong tricarination, some with the body whorl rounded and others showing gradations between those extremes. The difference in the outline of the body whorl is not restricted to the size or age of the shell. The factor of continuous variation in *Ficopsis penita* might be used to an advantage in the description and comparison of species of *Ficopsis* in other Eocene basins.

The West Coast analogue of this species is *F. remondii* (Gabb)[425] of Califronia. *F. remondii* has a more slender outline of the body whorl.

Conrad noticed that the variation in the carination of the body whorl was continuous and that the carinated variety was not

[425]Gabb, Wm., Pal. Cal., vol. I, pp. 87, 211, pl. 18, fig. 36, [illegible]; Stewart, [illegible] 6 pl. XXX figs. 1, 2.

distinct. His type collection at the Philadelphia Academy of Natural Sciences includes excellent specimens of a tricarinated, bicarinated, unicarinated and rounded body whorl. It is in cases such as *F. pentia* in which only large collections reveal the real characters of a species, that an horizon such as the Gosport sand is the important key. Specimens as those with the tricarinated and the rounded whorl when found singly or in small numbers at isolated localities lead to distinct naming. But when the series is found as in the "sand" one sees that the relationship is continuous.

F. penita differs from the Paris Basin *F. tricarinata* (Lam)[426] by not attaining the large size of the Parisian, by being more slender and by having a distinct, finer reticulated sculpture. The genus is represented by several species in the West Coast and Paris Basin Eocene.

Dimensions.—Height, 32 mm.; greatest diameter, 17 mm., lectotype. Height, 38 mm.; greatest diameter, 20 mm., lectotype *Pyrula cancellata* Lea. Height, 16 mm.; greatest diameter 6 mm., lectotype *P. elegantissima* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5803, A. N. S., lectotype, *P. cancellata* Lea; No. 5807, A. N. S., lectotype *P. elegantissima* Lea

Occurrence.—Lower Claiborne: localities 24, 726, 728, 730, 731, 733, 734, 741, 755, 756, 803 and 831. Gosport sand, locality 104 (type).

Ficopsis texana (Harris) Plate 34, figs. 14-19

Pyrula (*Fusoficula*) *texana* Harris, 1895, Acad. Nat. Sci., Phila., Proc., vol. 47, p. 77, pl. 8. fig. 11; Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2, p. 14, pl. 2, fig. 12, 12a; Wrigley, 1929, Mal. Soc. Lond., Proc., vol. XVIII, pt. V, p. 247.

Ficopsis texanus (Harris) Stewart, 1926, Acad. Nat. Sci. Phila., vol. 78, p. 375.

Odontopolys texana Ald. MS. in Aldrich, 1895, ibid, p. 14.

Volutilithes? rectus Ald. MS. in Aldrich, 1895, ibid, p. 14.

Fulguroficus texana (Harris) Wrigley, 1929, ibid, p. 249.

General form as indicated by the figure; whorls (in a mature specimen) at least 6; apex obtuse; whorls 1, 2 smooth; 3 spirally striate in part, and in part striate and costate; 4 and 5 with spiral raised lines alternating in size, and with longitudinal folds or costæ, the latter occasionally becoming varicose; body whorl marked by four spiral lines on the humeral region, below by three series of spiral lines, and by about twenty rather irregular longitudinal costæ; outer margin of the labrum sharp, within thickened

[426]See Cossmann, M., and Pissarro, G., 1910-1913, pl. 33, f. 164-1.

and with rather irregular crenules; columella generally smooth; but sometimes with two irregular swellings just below the point of greatest curvature.

This is a very strange form. The apex is very obtuse and the nuclear whorls as a whole are generally deflected somewhat from the axis of the adult shell. So far the species is a true *Pyrula*. Moreover the striation is that of *Pyrula*, but the costation is more irregular than in any of the known species of that genus; in fact it varies from moderately fine Pyrula-like lines to strong varices. The swellings on the columella, though in no wise true plaits, are worthy of note. They are evidently of the same origin and nature as those in *Mazzalina*.

Localities.—Mosley's Ferry, Brazos River, Burleson Co., Little Brazos River, near iron bridge; Cedar Creek, Lee Co.; Dunn's Ranch, Robertson Co. This species is also found in various places in Bienville Parish, La., and in Mississippi 2½ miles east of Newton.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

This species is not stabilized as is seen by occasional specimens becoming varicose and the columella acquiring callus deposits. Such irregular deposits on the columella are not worthy the name of fold or plication. Both characters do not occur as a normal feature hence the species does not deserve a subdivisional or divisional distinction from *Ficopsis* the characters of which the average shell exhibits. The species is abundantly distributed and occurs in large numbers at certain localities.

Dimensions.—Height, 21 mm.; greatest diameter, 10 mm.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 707, 708, 723, 725, 726, 727, 728, 729, 730, 731, 773 and 832.

Genus **FUSOFICULA** Sacco, 1890.[427]

Genotype by monotypy *F. apenninica* Sacco, 1890 [=*Pyrula subelegans* d'Orbigny, 1852]. Tongrian. Liguria.

Fusoficula angelinensis Harris Plate 34, fig. 6

Fusoficula angelinensis Harris, 1919, Bull. Amer. Pal., vol. VIII, No. 33, p. 18, pl. 2, fig. 15.

This species is remarkably like the general shape and sculpture of the type of the genus *F. apenninica* Sacco from the Oligocene of Liguria. They are the same size. This Eocene species occurs with a fauna which Prof. Harris described from the Angelina River, 2 miles above Marion, Angelina County, Texas. Associat-

[427]Sacco, F., Boll. Mus. Zool. Anat. Comp. Torino, vol. I, No. 86, p. 26, 1890; Sacco, F., I Molluschi terreni terziarii del Piemonte e della Liguria, pt. 8, p. 38, pl. I, fig. 50 a, b, 1891; Sacco, F., I Molluschi terreni terziarii Piem. e della Liguria, pt. 30, p. 39, 1904 *F. apenninica* Sacco=*Pyrula subelegans* d'Orb., 1852 new name for *P. elegans* Grateloup, 1845, non Lamarck, 1804.

ed with the number of lower Claiborne forms in the fauna are some Jackson species.

Dimensions.—Height, 22 mm., holotype.

Holotype.—No. 1414, Paleontological Research Institution.

Family **BURSIDÆ** (Ranellidæ).

Genus **RANELLINA** Conrad, 1865.[428]

Genotype by monotypy *Ranellina sulcata* (Lea)=*Tuba sulcata* Lea=*Ranella Maclurii* (Conrad). Eocene. United States.

Ranellina sulcata (Lea) Plate 34, figs. 4, 5; Plate 84, figs. 3, 5, 8, 11

Tuba sulcata I. Lea, 1833, p. 129, pl. 4, fig. 119 young; H. C. Lea, 1848, p. 106; Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2, p. 15.
Ranella Maclurii Conrad, 1855, p. 55, [no description], pl. 18, fig. 9; de Gregorio, 1890, p. 98, pl. 7, fig. 47; Cossmann, 1893, p. 32.
Gyrineum Maclurii Conrad, 1856, Acad. Nat. Sci. Phila., Proc., vol. VII, p. 31.
Triton pyramidatum H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, p. 99, pl. 1, fig. 16 young; H. C. Lea, 1848, p. 106.
Sanellina Maclurii Conrad, 1865, p. 21 [missprint for *Ranellina* corrected on p. 191 same reference].
Ranellina Maclurii Conrad, 1866, p. 17; Dall, 1890, p. 130; Harris, 1895, p. 26; Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 89; Cossmann, 1906, Essais Pal. Comp., 7 liv., p. 235; Stewart, 1926, Acad. Nat. Sci. Phila., Proc., vol. 78, p. 385.
Ranella ? pyramidata (H. C. Lea) de Gregorio, 1890, p. 98, pl. 7, fig. 29.
Pisania claibornensis Whitfield, 1865, Amer. Jour. Conch., vol. 1, p. 259, pl. 27, fig. 2; Aldrich, 1886, Cincinnati Soc. Nat. Hist., p. 79.
Algrus claibornensis (Whitfield) de Gregorio, 1890, p. 93, pl. 7, fig. 23; Cossmann, 1893, p. 34.

Shell elevated above, rounded below, with numerous transverse furrows, the two superior ones being indistinct; substance of the shell rather thin; apex not acute; suture impressed; umbilicus—; whorls inflated; mouth—.
Length . . . Breadth .2, of an inch.
Observations.—This fragment resembles so closely the two species above described, that I have with but little hesitation placed it in the same genus. It has apparently lost only one whorl—seven remain. It is rather more alternate than the preceding, and differs entirely in being furrowed, and having no longitudinal striæ. Some of the parts being absent, I am necessarily compelled to make an unfinished description and figure.—[Lea, 1833].

Various stages of individual growth of this species have been given different names by authors. Unless the name *Tuba sulcata* is found to be a homonym, the name given by Isaac Lea for the apical whorls of a young specimen has priority in naming. The species has usually gone by the specific name of *maclurii* Conrad. It is unfortunate that the name cannot continue to be used because the holotype of *Ranella maclurii* Conrad is an adult and perfect

[428]Conrad, T. A., 1865, pp. 21, 191.

specimen.

The Meyer drawings of the types of *Tuba sulcata* I. Lea, *Ranella maclurii* Conrad and *Triton pyramidatum* H. C. Lea are included herein as well as a photograph of the holotype of *Pisania claibornensis* Whitfield. These illustrations show the specimens represent one species. Aldrich first made this observation in 1895.

The author is indebted to Arthur W. Slocum, of the Walker Museum, University of Chicago for the figures and measurements of the holotype of *Pisania claibornensis* Whitfield.

Dimensions.—Height, 6 mm., holotype *Tuba sulcata* Lea; height, 17 mm., lectotype, *Ranella maclurii* Conrad; height, 11 mm., lectotype *Triton pyramidatum* H. C. Lea; height, 19 mm.; greatest diameter, 10.2 mm. - 13.0 mm. ["measured at right angles and parallel to the aperture"], holotype *Pisania claibornensis* Whitfield.

Lectotypes.—*Tuba sulcata* Lea, No. 5660; *Triton pyramidatum* H. C. Lea and *Ranella maclurii* Conrad, Academy of Natural Sciences, Philadelphia, Pa.; *Pisania claibornensis* Whitfield, "Whit. 1224, U. C. 24502," Walker Museum, University of Chicago.

Occurrence.—Gosport sand: Claiborne, Ala.

Family CYMATIIDÆ

Genus DISTORSIO (Bolten) Roeding, 1798.[429]

Genotype by subsequent designation, Pilsbry, 1922[430], *Distorsio anus* (Linné) = (*Murex anus* Linné). Living. Indo-Pacific.

Subgenus PERSONELLA Conrad, 1865.[431]

Genotype by monotypy *Distorsio septemdentata* Gabb. Eocene. United States.

Distorsio (Personella) septemdentata Gabb — Plate 34, figs. 10, 11

Distorsio septemdentata Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. IV, p. 380, pl. 67, fig. 21; Renick and Stenzel, 1931, Univ. Texas Bull., No. 3101, pl. VI, fig. 7.

Distorsio (Personella) septemdentata (Gabb) Conrad, 1865, p. 21; Conrad, 1866, p. 17; Pilsbry, 1922, Acad. Sci. Phila., Proc., vol. 73, p. 357; Woodring, 1928, p. 299.

Persona (Distorsio) septemdentata (Gabb) Heilprin, 1891, p. 395.

[429]Bolten, J. F., Roeding, P. F., 1798, p. 133.
[430]Pilsbry, H. A., 1922, p. 357.
[431]Conrad, T. A., 1865, p. 21.

Personella septemdentata (Gabb) Tryon, 1881, Man. Conch., vol. III, p. 6; Tryon, 1883, Struct. Syst. Conch. vol. II, p. 124; Wrigley, 1932, Mal. Soc. Lond. Proc., vol. XX, pt. II, p. 136, pl. 11, fig. 18.
Persona septemradiata Cossmann, 1893, p. 32 (error for *septemdentata*).
Persona septemdentatum (Gabb) Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 104, pl. IV, fig. 16.

Short, robust; whorls eight, spire short, acuminate; mouth patulous, outer lip thin on the edge, thickened behind the edge and with seven robust teeth internally, inner lip thin, with a few small teeth,canal short, recurved, surface marked by varices and by irregular longitudinal ribs, crossed by numerous thick revolving lines, giving a coarsely reticulated appearance; between the revolving lines are numerous finer striæ.

Dimensions.—Length .9 in., length of mouth .4 in., width of body whorl .5 in.—[Gabb, 1860].

Nucleus consists of two and a half, smooth whorls, nucleus flattened; the spiral threads begin on the third whorl and continue on the last part of the whorl into the cancellated sculpture of the post-nuclear whorls.

The longitudinal ribs become obsolete on the last part of the penultimate and all of the body whorl, traces of such features consist of faint, irregular nodes. The sculpture of this part of the shell is composed mainly of the varices and wide, spiral ribs with subequal interspaces which contain faint, spiral lines.

This species marks the initiation of the genus *Distorsio* in the American Tertiaries. It is followed in the Vicksburg Oligocene by a typical representative of the genus, *D. crassidens* Conrad.

The form is abundant in the lower Claibornian, widely distributed from Texas, Louisiana through Mississippi.

Dimensions.—Height 22 mm.; greatest diameter, 15 mm., lectotype.

Lectotype.—No. 13284, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: Wheelock Texas (Gabb), localities 723, 724, 725, 726, 728, 730, 731, 741, 743, 747, 765, 766 and 803.

Family CORALLIOPHILLIDÆ

Genus CORALLIOPHILA H. and A. Adams, 1853.[432]

Genotype by subsequent designation, Iredale, 1912.[433]

[432]Adams, H. and A., 1853, vol. I, p. 135.

[433]Iredale, T., Mal. Soc. Lond., Proc., vol. 10, p. 221, 1912, prior to Cox, L. R., 1927, p. 90.

C. neritoideus Chem.=*Purpura violacea* Kiener.[434] Living. Indo-Pacific.

Subgenus **ALDRICHIA** new subgenus

renamed Timothia Palmer, LPBul 24, 1938 p3

Genotype *Murex cancellaroides* Meyer and Aldrich=*Muricopsis aldrichi* Cossmann=*Aldrichia aldrichi* (Cossmann). Lower Clabornian Eocene. Mississippi.

Shell stout, body whorl enlarged; aperture large; canal short; outer lip crenulated within; umbilical groove present; sculptured with large, longitudinal folds crossed by spiral, scabrous ribs.

This subgenus differs from typical *Coralliophila* in having a considerably more elevated spire and greater longitudinal sculpture.

Coralliophila (Aldrichia) Aldrichi (Cossmann) Plate 34, figs. 1-3

Murex cancellaroides Meyer and Aldrich, 1886, Cincinnait Soc. Nat. Hist. Jour., vol. IX, p. 44, pl. II, fig. 15 non *M. cancellaroides* Grateloup, 1834, p. 99.

Muricopsis Aldrichi Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 34 new name.

Short-fusiform. Aperture and canal less than half of the length of the shell. Embryonic whorls three. Adult whorls five with crowded oblique, rib-like, varices, becoming obsolete on the body whorl. They are covered by numerous, alternating, prominent, elevated, revolving lines. Columella, with an umbilicate fissure. Canal short, straight. Aperture regularly rounded posteriorly. Outer lip thickened, crenate within, the crenation at the middle of the whorl being the strongest.

Newton.

Only the figured specimen has been found.—[Meyer and Aldrich, 1886].

Nucleus consists of two, minute, smooth whorls; third whorl has a spiral line on the mid-line of the whorl; fourth and fifth whorls have four, spiral ribs without intervening, spiral lines or longitudinal folds; longitudinal folds begin on the fifth whorl; spiral ribs are scabrous and brittle, the peculiar surface character typical of Recent species of *Coralliophila*.

The spire is elevated more than the type species of the genus but it is strikingly like in shape, twist of the form, and sculpture to *C. deformis* Gould from the Hawaiian Islands. It is similar in character to *C. granifera* (Michtti.), *C. umbilicata* Bellardi and *C. regularis* Bellardi from the middle Miocene of Italy as figured in Bellardi.[435]

[434] Woodring, W. P., 1928, p. 296.

[435] Bellardi, L., I Molluschi dei terreni terziarii del Piemonte e della Ligurai, pt. III, pp. 196, 198, 199, pl. XII, figs. 7, 16, 18, 1882.

Dimensions.—Height, 13 mm.; greatest diameter, 8 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 724, 728 and 770 type)

Family MURICIDÆ

Genus MUREX Linnæus 1758[436]

Genotype by subsequent designation, Montfort[437], 1810, *Murex pecten* Montfort=*M. tribulus* Linnæus. Living. Indo-Pacific.

Murex Vanuxemi Conrad Plate 35, figs. 2, 5, 9, 12; Plate 84, fig. 1

Murex Vanuxemi Conrad, 1834, App. in Morton, p. 5; Conrad; 1865, pp. 16, 210, pl. 20, fig. 4; Conrad, 1866, p. 19; de Gregorio, 1890, p. 94, pl. 7, fig. 25; Heilprin, 1891, p. 395; Cossmann 1893, p. 32; Harris, 1895, p. 47.

Fusiform; volutions 5; those of the spire angular in the middle, where there is a subspinose line, another line of equal size revolves below with a fine intermediate line; longitudinal ribs on the body whorl 7; whorls of the spire with close rugose revolving lines above the angle; body whorl with revolving squamose ribs and an intermediate squamose line; labrum thick, dentate within.

Locality.—Claiborne.—[Conrad, 1865].

Nucleus consists of from three to four and a half, smooth whorls; fine, revolving ribs and lines are crossed by squamose, longitudinal lines of growth; such lines increase on the adult and give a fine, reticulate appearance; columella bears a few denticles in the young and immature specimen but is bare in the adult stage; the number of varices vary from five to seven.

This species of *Murex* and the following forms belong to a well represented group in the Eocene. Cossmann placed many of the species of a similar nature from the Paris Basin in the group *Poirieria* Jousseaume[438] of which *Murex zelandicus* Quoy and Gaimard is the type. *M. zelandicus* is a long, spinose form with a long canal and a frilled labrum but the labrum is not dentate. The Claibornian species do not fit into such a category. They have a short canal and the labrum is dentate within. This bears out the opinion by Wrigley[439] that the Paris Basin species do not properly

[436]Linnæus, C., 1758, p. 746.
[437]Montfort, D., 1810, p. 619.
[438]Jousseaume, F., Le Naturaliste, 2d yr., No. 41, p. 335, 1880.
[439]Wrigley, A., Proc. Mal. Soc. Lond., vol. XIX, pt. III, p. 102, 1930.

belong in *Poiricria.* The numerous named subgroups of *Murex* are typed mainly by Recent forms. The groups seem to be insufficiently known. To force many of the fossil species into the named groups would be putting them where they do not naturally belong. To make new names without working thoroughly those known would only add further confusion. The species are left under the broad classification of *Murex.*

Dimensions.—Height, 20 mm.; greatest diameter, 12 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 728, 731, 733 and 803. Gosport sand: locality 104.

Murex vanuxemi silvaticus, new variety Plate 35, figs. 10, 14

Nucleus consists of three to four, smooth whorls, conical. The nucleus is similar to that of *M. vanuxemi* Conrad. The Harris collection contains a large suite of the species in all stages of growth. There are seven, spinose varices. The varices are crossed by prominent, spiral ribs, two on the whorls of the spire and from six to eight on the body whorl, depending on the age of the specimen. The majority of specimens have the surface of the shell, between the primary ribs smooth, a few will have secondary spiral lines on the body whorl. The character of smoothness is the feature which differentiates this form from the parent species. *M. vanuxemi* is characteristically covered longitudinally with fine, close and regular, wavy lines of growth and frequently with spiral lines between the primary ribs on the whorls of the spire. The two forms are characteristically alike in shape, number of whorls, number of varices and conspicuously in the occurrence of two, prominent, revolving ribs on the whorls of the spire. *M. vanuxemi silvaticus* has the varices more spinose than *vanuxemi.* The smoothness of the interspaces on the body whorl of *silvaticus* is not limited to a growth stage but occurs throughout the life history. For this reason the two forms are separated. *M. vanuxemi* has the longitudinal, fine lines in young stages as well as in the adult.

M. silvaticus is abundant at the type locality. There is one worn specimen from Hickory, Miss. which has the smooth interspaces but it differs slightly in shape. This species may be what

Meyer and Aldrich[440] had when they reported the Jackson *Murex angulatus* ? Meyer[441] from Hickory, Miss.

Dimensions.—Height, 12 mm.; greatest diameter, 8 mm.

Holotype.—No. 3003; paratype No. 3004, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 24, 723, 725 and 741 (type).

Murex fusates Harris — Plate 37, figs. 17-21

Murex fusates Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 74, pl. 8, fig. 5.

Size and general form as indicated by the figure; whorls 8; 1, 2, 3, 4, smooth and polished, very small; 5, 6, 7 with about three coarse revolving raised lines, with obtuse regular longitudinal costæ; body whorl with regular strong raised lines on its larger portion and finer ones below, also with seven obtuse costæ over which the spiral lines pass; labrum with five or six crenulations within; a basal Nassa-like fold on the columella.

In a general way this species resembles *M. vanuxemi* Con., but the costæ are very different and show no signs of forming acute angles, folds or spines.

Locality.—Smithville, Bastrop Co., Tex.
Geological horizon.—Lower Claiborne Eocene.
Type.—Texas State Museum.—[Harris, 1895].

The nucleus consists of four, smooth whorls, the first minute. Longitudinal ribs or lamellæ only occur on the first whorl of the post-nuclear whorls.

This species differs from *M. vanuxemi* Conrad which also occurs at Smithville and which superficially resembles *fusates*, in lacking the fine, interstitial, revolving ribs and the coarser, longitudinal lines. The primary, revolving ribs are heavier on *fusates* and there are three in place of two as on *vanuxemi*. The specimens in the Harris collection of the species from Smithville have from seven to ten, longitudinal costæ.

Dimensions.—Height, 19 mm.; greatest diameter, 8 mm.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 733.

Murex colei, new species — Plate 35, figs. 4, 6

Shell medium in size; spire elevated; nucleus broken; post-nuclear whorls consist of five whorls; convex; labrum thickened

440 Meyer, O. and Aldrich, T. H., Cincinnati Soc. Nat. Hist., vol. IX, No. 2, p. 48, 1886.
441 Meyer, O., Geol. Sur. Ala., Bull. No. 1, pt II, p. 74, pl. 2, fig. 18, 1886.

with the lamellæ of the varix crenate within; columella smooth, with a denticle at the margin of the canal; canal constricted, medium in length; false umbilicus; seven varices on the body whorl; there are three primary, revolving ribs on the first whorls of the spire with five irregular, primary spiral ribs on the penultimate whorl; a secondary, spiral rib occurs between the primary over the whole surface of the whorls.

The species differs from *M. mantelli* in being higher spired, with less width to the body whorl, in having a secondary spiral rib between the larger ribs and the varices lacking the frilled character at the intersection of the spiral ribs. The form is similar in shape to *M. vanuxemi* but differs in having more revolving, primary ribs and in having a single, secondary, spiral line.

The species is named in honor of Dr. W. Storrs Cole, of the Geology Department at Ohio State University.

Dimensions.—Height, 26 mm.; greatest diameter 14 mm.

Holotype.—No. 3002, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 707.

Murex veatchi, new species Plate 36, figs. 7, 11, 12

Shell elongate; spire elevated; post-nuclear whorls four; anterior canal long; varix sculpture trilobate, with the varices wide and flaring; midway between the varices is a longitudinal fold which is subdued forming a large node on each whorl; the longitudinal sculpture is crossed by spiral lines, widely spaced on the flared varices; on a fragment of an old individual intermediate ribs are developed on the labrum flange and the primary ribs are large and coarse; labrum crenate on the inner margin.

This species was suggestive of the *Murex tricarinatus* Lamarck stock of the Lutetian of the Paris Basin and of the Bracklesham beds of England. Two specimens, from the localities 724 and 725 respectively, were sent to Mr. Arthur Wrigley of London, England, for comparison particularly with his form *lobatus*.[442]

The following notes were kindly made by Mr. Wrigley after comparing the specimens:

[442]Wrigley, A., Mal. Soc. Lond., Proc., vol. XIX, pt. III, p. 94, pl. 9, fig. 4, 1930.

"*lobatus* in my plate 9, fig. 4, is a lobate form of a spinose species shown in figs. 2 and 3 (and to some extent in fig. 5). The spines are simply connected into flat lobes projecting, as do the spines, from a comparatively narrow varix. [In *M. veatchi* there is] no trace of spines, but that a simple, fairly wide, flanged varix (spec. No. 725) is expanded, in spec. No. 724, into broad lobes.—lobatus and its allied forms have 9 or 10 spirals, [*M. veatchi*] has only 6."

The species, which is closest to this form is an undescribed species from the Jackson Eocene.

Named in honor of A. C. Veatch who collected the specimens.

Dimensions.—Height, 16 mm.; greatest diameter, 9 mm., holotype.

Holotype.—No. 3012; paratypes Nos. 3011, 3013 and 3014, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 724 and 725 (type).

Murex engonatus Conrad Plate 36, figs. 9, 10, 13; Plate 84, fig. 6

Murex engonatus Conrad, 1834, App. in Morton, p. 5; Conrad, 1833, Sept. p. 30; H. C. Lea, 1848, p. 101; d'Orbigny, 1850, p. 365; Conrad, 1865, pp. 16, p. 210, pl. 20, fig. 10; Conrad, 1866. p. 18; de Gregorio, 1890 p. 94, pl. 7, fig. 26; Cossmann, 1893, p. 32; Harris, 1895 p. 19.

Fusus sexangulus Conrad, 1834, Acad. Nat. Sci. Phila., Jour. vol. VII, p. 144; H. C. Lea, 1848, p. 100; Harris, 1895, p. 41 non *Murex sexangula* Dall, 1915.

Murex (*Pteronotus*) *engonatus* Dall, 1890, p. 142 [including *Fusus sexangulus* Conrad].

Shell thick, fusiform, transversely striated, umbilicated, with six angular varices on the body whorl, the striæ passing over them; whorls six in number, and the varices continued in direct lines to the apex; beak rather thick; canal narrow. Length 1¼ inches.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Shell short fusiform, with six profoundly elevated longitudinal ribs on each whorl; and with fine spiral striæ; costæ somewhat foliaceous. Length, one inch.

Locality.—Claiborne, Alabama.—[Conrad, 1834 *sexangulus*].

The revolving striæ on the adult specimens are equal in size with an interspace of slightly narrower width. On young shells the lines tend to alternate in size.

The nucleus consists of four smooth whorls, the first minute, the last two large. The columella is smooth and the labrum is probably smooth within.

Dimensions.—Height, 34 mm.; greatest diameter, 18 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality 728 and 729. Gosport sand: locality 104.

Murex migus de Gregorio, Plate 35, figs. 1, 3, 7, 8, 11

Murex migus de Gregorio, 1890, p. 95, pl. 7, figs. 30-33; Cossmann, 1893, p. 32.
Murex stetopus de Gregorio, 1890, p. 96, pl. 7, fig. 34.
Murex tingarus de Gregorio, 1890, p. 96, pl. 7, fig. 36.

Testa parvula, elegans; primis quatuor anfractibus laevigatis!, sequentibus costatis funiculatisque; costis regularibus, rotundatis, notatis, in ultimo anfractu varicosis; funiculis spiralibus liriformibus, eas clathrantibus; apertura ovata canali antico paulo oblongo.

C'est une petite jolie espèce qui dans le jeune âge a beaucoup d'analogie avec le *Fusus bellus* Conr., dont elle diffère ayant les premiers tours lisses. Alors on pourrait aussi la confondre (surtout les exemplaires ayant le canal antérieur cassé) avec la *Nassa cancellata* Lea, dont elle diffère n'ayant pas les côtes obliques dans le troisème tour primordial. Losque elle atteint un certain développement, elle prend le facies d'un murex, les côtes sous la loupe acquièrent des caractères de véritables varices se prolongeant jusque dans la partie antérieur du canal.—(Coll. mon Cabinet).—[De Gregorio, 1890].

The author believes that Cossmann was justified in stating that the three species listed above, described by De Gregorio as distinct are only specimens of the same species. Specimens of the form have not been found at Claiborne. Two, important shells from the lower Claiborne at Hickory, Miss. have been found which are probably this species. The characters which may be observed agree with De Gregorio's figure.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Murex gosportensis Aldrich, new species Plate 36, fig. 3

Shell rather thick, whorls probably seven. Apex is broken also part of the body whorl. Seven prominent raised and rounded spirals alternating with those on each whorl and partially lapping over the suture; horizontal lines numerous, slightly raised, somewhat alternating on the body whorl, continuing down between an open canal and open umbilicus. The opening of the umbilicus very large and deep, nearly smooth within.

Length 32 mm.

Gosport Sand. Claiborne, Ala. Eocene.

Type [No. 72] in Ala. University Collection.—[Aldrich].

The umbilicus is probably a false umbilicus.

The description of this species and the figure included were sent to the author by the late Truman H. Aldrich. It is with pleasure and honor that I include the species in this report but with keen regret that its author was not able to see the completion of the work.

This form bears a close resemblance to *Lyropurpura crassi-*

costatus (Deshayes),[443] the type of *Lypropurpura* (Bayle) Jousseaume[444], from the Eocene of the Paris Basin.

"**Murex septemnarius** Conrad"

Murex septemnarius Conrad, 1834, Acad. Nat. Sci., Phila., Jour. VII, p. 154; H. C. Lea, 1848, p. 102; Conrad, 1865, p. 16 [spelled *septenarius*]; Conrad, 1866, p. 18; de Gregorio, 1890, p. 94; Harris, 1895, p. 41.

Shell short, subfusiform, with seven varices, and prominent spiral subscabrous striæ, with a fine line between; shoulder with prominent, acute, foliated spines; whorls angular, densely striated above; spire rather longer than the beak, which is reflected; labrum thickened within; with a few short, prominent lines near the margin; margin slightly waved; aperture small, subovate; canal open. Length, one inch.

Locality.—Claiborne, Alabama.—[Conrad, 1834].

This species was neither figured by Conrad nor by subsequent authors. The type is apparently lost and the species has not been rediscovered.

Subgenus **PHYLLONOTUS** Swainson, 1833[445]

Genotype by monotypy *Murex imperialis* Swainson=*Murex pomum* Gmelin. Living. West Indies and southeastern United States.

Section **FAVARTIA** Jousseaume, 1880[446]

Genotype by original designation *M. breviculus* Sowerby. Living. South Pacific.

Murex (Phyllonotus) Mantelli Conrad

Plate 35, figs. 13, 15-17; Plate 84, fig. 10

Murex Mantelli Conrad, 1834. Acad. Nat. Sci., Phila., Proc. vol. VII, p. 154; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 102; Conrad, 1865, pp. 16, 210, pl. 20, fig. 11; Conrad, 1866 p. 18; de Gregorio 1890, p. 95, pl. 7, fig. 28; Cossmann, 1893, p. 32; Harris 1895, p. 27.

Murex conradi d'Orbigny, 1850, p. 364.

Murex (*Muricantha*) *mantelli* (Conrad) Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 29, pl. 1, fig. 12 section *Favartia*.

[443]Deshayes, G. P., Descrip. Coq. Fos. Env. Paris, tome 2, p. 601, pl. 82, figs. 13-14, 1835; Deshayes, G. P., Descrip. An. sans Vert., tome 3, p. 318, 1865. For dates see Newton, R. B., 1891, p. 308.

[444]Jousseaume, F., Le Naturaliste, 2d. yr., No. 41, p. 335, 1880, genotype by original designation.

[445]Swainson, Wm., Zool. Illus., 2d ser. vol. II, pl. 67, 1831-32 [*M. imperialis* figured]; Swainson, Wm., ibid, vol. III, p. 109, pl. 109 non pl. 100 as stated in text, 1833.

[446]Jousseaume, F., "Etude sur les Purpurides", Revue de Zoologie. fasc. 1, 1879; Jousseaume, F., Le Naturaliste, 2d. yr. No. 41, p. 335, 1880 (synopsis of genera with types).

Shell subfusiform; body whorl inflated; with six angular varices, crossed by prominent equidistant lines, expanding on the varices, and terminating in very short, foliated, obtuse spines: between the lines is a fine stria; fine longitudinal striæ passing over the spiral lines; spire short; aperture ovate; channel nearly closed; beak larger than the spire, reflected. Length, one inch.

Locality.—Claiborne, Alabama.—[Conrad, 1834].

The nucleus consists of three or three and a half, smooth whorls. There are more often seven varices than six as mentioned by Conrad.

Dimensions.—Height, 28 mm.; greatest diameter, 19 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Genus **MUROTRITON** de Gregorio, 1890[447]

Genotype by original designation, *M. grassator* de Gregorio. Eocene. United States.

Murotriton grassator de Gregorio — Plate 36, figs. 2, 6

Triton ? (Murotriton) grassator de Gregorio, 1890, p. 97, pl. 7, figs. 41-43.
Murotriton grassator (de Gregorio) Cossmann, 1893, p. 32, Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 90.

Testa ovata, fusiformis, solidiuscula; spire turbiformis; costis circiter 12, regularibus, in ultimo anfractu antice vix foliaceis; anfractibus postice subangulatis; funiculis spiralibus circiter 3 ad anfractum; circiter 7 autem in ultimo; apertura ovata; labro interno conspicuo laevigato; externo incrassato, varicoso, intus tuberculato; canali antico erecto.

La forme des côtes ressemble davantage à celle du gen. *Murex* plutôt qu'à celle du gen. *Triton,* mais l'ensemble de la coquille rappelle certains *Triton* du type du *Triton corrugatus* Lamk., surtout les exemplaires du *postpliocène* (De Greg. St. Conch. Medit. viv. e foss. p. 96, 403), il diffère de cette espèce surtout par le manque des larges varices dispersées sur la surface des tours.

Il a quelque analogie avec le *Murex bicostatus Desh.* (Deshayes Coq. Paris pl. 81, f. 28-29) et avec le *T. pyraster* Lamk. (Idem pl. 80, f. 36-37). Il diffère de tous les deux par le nombre et le développement des côtes.—[De Gregorio, 1890].

A distinguishing mark of this species is the groovelike area between the suture and the first revolving rib of the whorl. The longitudinal folds except the varix just back of the labrum, are not lamellar, spinose or frilled. The longitudinal lines of growth are coarse. The longitudinal folds do not extend the full length of the body whorl.

Dimensions.—Height, 20 mm.; greatest diameter, 18 mm.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

[447] de Gregorio, A., 1890, p. 97.

Occurrence.—Gosport sand: locality 104.

Murotriton mcglameriæ new species Plate 36, figs. 4, 8

Nucleus consists of four smooth whorls which are elevated; on the fourth whorl for a short space fine, sharp, longitudinal ribs occur crossed by fine, spiral lines giving the surface a definite, cancellated appearance; longitudinal ribs increase in size and diminish in number; on each succeeding whorl the series of ribs become obsolete until on the body whorl there are five varices only; the varices are in line, longitudinally with the varix or rib of the succeeding whorl; in this character the form is like the genera of the Tritonidæ; whorls grooved above and below the suture, two of the revolving ribs in the midregion of the whorls enlarged giving the whorls a bicarinate shape; remaining spiral ribs are fine and regular with interspaces about equal in width; on the basal portion of the body whorl the spiral ribs are enlarged with a fine, spiral line between the larger ribs; canal straight and long; columella smooth; labrum dentate within.

This species differs from the type of *Murotriton* in having a straighter canal and the columellar callus is not thickened and liplike. The longitudinal folds are fewer and varicose in *mcglameriæ*. The species has the characteristic groove in the sculpture below the suture.

The species is named in honor of Winnie McGlamery, paleontologist of the Geological Survey of Alabama.

Dimensions.—Height, 19 mm.; greatest diameter, 10 mm.

Holotype.—No. 3010, Paleontological Reearch Institution.

Occurrence.—Lower Claiborne: localities 707, 708 and 728 (type).

Genus **TYPHIS** Montfort, 1810[448]

Genotype by original designation, *Murex tubifer* Bruguière. Eocene. Paris Basin.

Section **LÆVITYPHIS** Cossmann, 1903[449]

Type by original designation *T. coronarius* Deshayes. Eocene. Paris Basin.

Typhis gracilis Conrad Plate 36, figs. 1, 5; Plate 85, fig. 12

Typhis gracilis Conrad, Jan., 1833, Amer. Jour. Sci., vol. 23, p. 344;

[448]Montfort, D., 1810, p. 615.
[449]Cossmann, M., Essais Pal. Comp., 5 liv., p. 59, 1903.

Conrad, 1834, App. in Morton, p. 6; H. C. Lea, 1848, p. 107; Conrad, 1865, p. 16; Conrad, 1866, p. 19; Harris, 1895, p. 21; Wrigley, 1930, Proc. Mal. Soc. Lond., vol. XIX, pt. III, p. 114.

Murex alternata Lea, Dec., 1833, p. 157, pl. 5, fig. 163; H. C. Lea, 1848, p. 102; Harris, 1895, p. 4.

Typhis alternata (Lea) de Gregorio, 1890, p. 96, pl. 7, figs. 38-40; Cossmann, 1893, p. 32.

Typhis alternatus (Lea) Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 59, pl. II, fig. 26 section *Lævityphis.*

Shell fusiform, elongated, slender, volutions about eight; ribs of the body whorl 4, thickened and slightly reflected; with two or three arched scales on each; margin of the aperture elevated but not reflected. Length one third of an inch.

Locality.—Claiborne, Alab. *London clay.*—[Conrad, 1833].

Frequently the varix which terminated the aperture has tubercles extending at intervals along its length. Initial tubercles occur along the length of the other varices of the body whorl.

The species is fairly abundant in the "sand".

The Paris Basin relative of this species is *T. coronarius* Deshayes[450], of the Cuisian, the species which Cossmann used as the type of his section.

The Conrad type collection consists of 4 specimens, none of which was ever figured. The Meyer drawing of one of the specimens is included herein. That specimen is selected as lectotype.

Dimensions.—Height, 19 mm.; greatest diameter, 8 mm., lectotype. Height, 23 mm.; greatest diameter, 10 mm., largest Conrad specimen.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; lectotype *T. alternata* Lea, No. 5813, A. N. S.

Occurrence.—Gosport sand: Claiborne, Ala. (localities 104 and 782).

Genus ODONTOPOLYS Gabb, 1860[451]

Genotype by original designation, *O. compsorhytis* Gabb. Eocene. United States.

Odontopolys compsorhytis Gabb — Plate 34, figs. 7-9

Odontopolys compsorhytis Gabb, 1860, Acad. Nat. Sci., Phila., Proc. 2d. ser., vol. IV, p. 377, pl. 67, fig. 16; Conrad, 1865, p. 16; Conrad, 1866, p. 19; Tryon, 1883, Struct. Syst. Conch., vol. II, p. 105, pl. 43, fig. 4;

[450]Deshayes, G. P., An. sans Vert., tome III, p. 335, pl. 88, figs. 11-13, 1865.

[451]Gabb, W. M., Acad. Nat. Sci. Phila., Proc. 2d ser. vol. IV, p. 377, 1860.

Aldrich, 1886, Bull. Geol. Sur. Ala., vol. I. p. 46; de Gregorio, 1890, p. 96, pl. 6, fig. 47; Cossmann, 1893, p. 32; Harris, 1895, Acad. Nat. Sci., Phila., Proc., vol. 47, p. 75, pl. 8, fig. 6; Cossmann, 1903, Essais Pal. Comp., 5 liv., p. 35, fig. 1.

? *Murex* (*Odontopolys*) *compsorhytis* (Gabb) Heilprin, 1891, p. 395.

Shell triangular; whorls six; three squamose varices; on the body whorl between the two varices which enclose the aperture are two elongated nodes, on the angle of the whorl, between the the next two to the left there are three of these nodes, and in the remaining space there are four, which in this last case extends on the top of the whorl to the suture, and to the anterior extremity of the shell as distinct ribs; these are crossed by a few delicate revolving lines, spire acuminate, canal moderately long and nearly straight; aperture narrow; two plates or folds on the columella, a small rudimentary tooth at the posterior extremity of the mouth, on the inner lip; outer lip thickened and with seven or eight prominent heavy teeth.

Dimensions.—Length .75 in., length of the aperture .5 in., width of body whorl .45.

Locality.—Wheelock, Texas. Collection of the Smithsonian Institution.

This shell differs so materially from all the other Murices, that I propose to make it the type of a new subgenus, as above. It resembles the subgenus *Pteronotus* in arrangement of the varices, but the folds on the columella and the crenulations of the outer lip will serve to distinguish it.—[Gabb, 1860].

This species is apparently the only representative of its particular muricid development. The "*O.*" *triplicata* Meyer[452] of the Jackson Eocene does not belong to this genus. It is as Harris stated a young volute.

The nucleus consists of two and one half or three, smooth whorls.

There are two folds on the columella on the specimen figured from 730. The folds are more pronounced within the aperture and hence do not show plainly in the figure.

The type came from Wheelock, Texas. The species apparently was fairly common at Hammett's Branch, La., for the specimen which Harris figured in 1895 and the only specimen which he had seen came from there. The only specimens (consisting of two) which the Paleontological Research Institution collections yield are from Hammett's Branch, La. One is herein figured.

Holotype.—Lost.

Occurrence.—Lower Claiborne: Wheelock, Texas. (Gabb); Lisbon horizon at Claiborne and at Lisbon, Ala. (Aldrich); locality 730.

[452]Meyer, O., Bericht Senckenb. Natur. Ges., p. 7, pl. 1, fig. 6, 1887; Harris, G. D., Acad. Nat. Sci. Phila., Proc., vol. 47, p. 75, 1895.

 274

Family PYRAMIMITRIDÆ

Genus PYRAMIMITRA Conrad, 1865[453]

Genotype by monotypy *P. terebræformis* (Conrad) (*P. costata* Lea). Eocene. United States.

Pyramimitra terebræformis (Conrad)

Plate 37, figs. 12-15; Plate 85, figs. 5, 14

Terebra costata Lea, 1833, p. 166, pl. 5, fig. 172; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 106; d'Orbigny, 1850, p. 369, Dall, 1895, U. S. Nat. Mus., Proc., vol. 18, p. 34; Harris, 1895, p. 13; non Borson, 1823; Saggio orittogr., p. 309 fide De Gregorio, 1890.

Mitra terebræformis Conrad, 1848, Acad. Nat. Sci., Phila., Proc., 2d. ser., Jour. vol. I, p. 132, pl. 14, fig. 30; Harris, 1895, p. 45.

Lirofusus gracilis Conrad, MS. labelled specimen A. N. S. fide Harris, 1895, pp. 13, 21.

Pyramimitra costata Conrad, 1865, p. 28; Conrad, 1866, p. 14; Heilprin, 1891, p. 400; Aldrich, 1895, Bull. Amer. Pal., vol. I, No. 2, p. 10, pl. 2, fig. 11.

Pyramimitra terebriformis Conrad, 1865, p. 28; Conrad, 1866, p. 14; de Gregorio, 1890, p. 19, pl. 1, fig. 54, pl. 10, fig. 23 under *Terebra;* Cossman, 1893, p. 38; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 126, pl. 8, figs. 10-11.

Terebra (*Pyramimitra*) *leai* de Gregorio, 1890, p. 19, pl. 1, fig. 55 new name for *T. costata* Lea.

Shell subulate, with low wide longitudinal ribs cut by sharp transverse striæ; substance of shell rather thin; spire elevated acutely pointed; suture furrowed; whorls nine, slightly convex; mouth narrow; columella biplicate; outer lip subcrenate, within striate.

Length 11-20ths, Breadth 3-20ths, of an inch.

Observations.—This is a much smaller species than the last, and its sharp transverse striæ, which are much more distant, together with the folded columella, render it impossible to confound them.—[Lea, 1833].

Subulate; whorls eight or nine, slightly convex, with obtuse longitudinal varices and sharp equal prominent revolving lines, four in number on each whorl of the spire; beak very short; labrum dentate within.

Locality.—Claiborne, Alabama.—[*terebræformis* Conrad, 1848].

The nucleus consists of three, smooth whorls. The first two or three of the post-nuclear whorls have the longitudinal ribs well developed but do not have any revolving ribs present except one rib just below the suture. The transverse ribs on the whorls of the spire are four in number as stated by Conrad. The whole surface of the shell is marked with microscopic, longitudinal striæ. Shells 3 mm. in height have the sculpture of the adult fully developed.

The name *Terebra costata* given by Lea to the species is pre-
for *costata* Lea. Since the *terebræformis* of Conrad is synony-
occupied by Borson. De Gregorio gave a substitute name *leai*

[453]Conrad, T. A., 1865, p. 28.

for *costata* Lea. Since the *terebræformis* of Conrad is synonymous with *costata,* De Gregorio's new name is unnecessary. Conrad did not designate a type for his genus *Pyramimitra* but the two species listed by him being synonymous, *P. terebræformis* (Conrad) becomes the monotype of *Pyramimitra.*

The Meyer drawings of the holotypes of Conrad's and Lea's specimens are included herein.

The species originated in the lower Claiborne where the shells have the longitudinal ribs more pronounced and the shell more slender. The sculpture becomes irregularly nodose where the spiral lines cross the longitudinal folds.

Dimensions.—Height, 9 mm.; greatest diameter, 3 mm., lectotype, *P. terebræformis* (Conrad) broken. Height, 11 mm.; greatest diameter, 4 mm., lectotype, *Terebra costata* Lea.

Lectotypes.—Academy of Natural Sciences, Philadelphia, Pa.; *T. costata* Lea, No. 5850, A. N. S.

Occurrence.—Lower Claiborne: localities 723, 727 and 741. Gosport sand: locality 104. Jackson Eocene: Jackson, Miss. (Aldrich).

Pyramimitra olssoni, new species Plate 37, figs. 8, 9

Shell slender, whorls slightly convex; apical whorls destroyed; surface sculptured with close-set, spiral ribs; five, primary, spiral ribs, the last resembling a cord just above the suture; the primary ribs alternate with a smaller series; all are crossed by longitudinal folds which give the spiral ribs a nodose character; this does not include the spiral ribs at the suture; the longitudinal folds die out on the middle and lower part of the body whorl, but the spiral ribs continue to the base; three, large plications occur on the columella; anterior canal short but probably as long as on the genotype; anterior canal broken on the holotype; columellar callus extends back and ends in a flare.

The species has a cerithioid appearance but differs in the presence of the prominent plications.

P. olssoni differs from *P. terebræformis* (Conrad) in having a greater apical angle. The apical angle of *P. terebræformis* is 15°

The spirals of *P. olssoni* are close-set, having an intermediate stria and are more in number than in *P. terebræformis.*

The columellar callus is larger in *P. olssoni.*

Named in honor of A. A. Olsson.

Dimensions.—Apical angle 20° ; height, 10+ mm. (apex broken) ; greatest diameter, 4 mm.

Holotype.—No. 3021, Paleontological Research Institution.

Occurrence.—Gosport sand: locality 104.

Family **COLUMBELLIDÆ**[454] (Pyrenidæ)

Genus **COLUMBELLA** Lamarck, 1799[455]

Genotype by monotypy, *Voluta mercatoria* Linnæus. Living. West Indies.

"Columbella" punctostriata Johnson Plate 37, fig. 4

Columbella punctostriata Johnson, 1899, Acad. Nat. Sci., Phila., Proc. vol. 51, p. 76, pl. II, fig. 4; Pace, 1902, Proc. Mal. Soc. Lond., vol. V, p. 126.

Shell subfusiform, spire prominent (apical whorls wanting), whorls convex, with several varices, reticulated by seven revolving ridges and numerous fine longitudinal ribs; these become obsolete or wanting on the body whorl. Anterior half of the body whorl with numerous revolving, punctated striæ; aperture narrow, contracted, outer lip thick, sinuous, inner margin crenulated with 18 teeth-like ridges, inner lip smooth except at the anterior and posterior ends, where it is slightly rugose. Length 10 mm. (with apical whorls probably 12), greatest diam. 5 mm.

One specimen collected by the writer from the Lower Claiborne at Berryman's Place, three miles northeast of Alto, Cherokee Co., Texas.—[Johnson, 1899].

This *Columbella*-like form is distinct from the other Eocene species of the same family. It has the narrow aperture, heavy labrum and callus of the labrum, with a slight posterior canal and twist to the anterior part of the labrum, of the *Columbella.* It is stout like *Columbella* and *Pyrene.* The dentation on the inner lip is weaker than on *Columbella* sensu stricto and stronger than on *Pyrene* (Bolten) Roeding (*Conidea* Swainson). The spire seems to be more elevated than *Columbella.* It probably does

[454]Pace, S., Cont. to the Study of the Columbellidæ, Proc. Mal. Soc. Lond., vol. 5, p. 37, 1902; Pilsbry, H. A. and Lowe, H. N., Acad. Nat. Sci. Phila., Proc. vol. 84, p. 70, 1932.

[455]Lamarck, J. B., 1799, p. 70 *Columbella* Lam. 1799, mt. *Voluta mercatoria* L. Official List of Generic Names, Summary of Opinion Rendered Int. Rules Zool. Nomenclature, No. 94, Smith. Misc. Coll. vol. 73, No. 4, p. 12, 1926.

not belong in *Columbella* s. s. *Columella* in the strict sense has not been found as yet below the Pliocene.

Holotype.—No. 9740, Academy of Natural Sciences, Philadelphia, Pa.

Genus **MITRELLA** Risso, 1826[456]

Genotype by subsequent designation, Woodring, 1928[457] *Mitrella flaminea Risso* (=*Murex scriptus* Linnæus). Recent. Mediterranean.

Subgenus **COLUMBELLOPSIS** Bucquoy, Dautzenberg, and Dollfus, 1883[458]

Genotype by original designation *Columbella minor* Scacchi. Recent. Mediterranean.

Cossmann places the genus *Columbellopsis* Bucquoy, Dautzenberg and Dollfus as synonymous with *Atilia* H. and A. Adams, 1853, designating *Mitrella minor* (Scacchi) as type of *Atilia*. Such a species is not avaiable for *Atilia* because is was "not included under the generic name at the time of its original publication[459]. Pace[460] states that *C. suffosa* Sow. was selected by Chenu[461] in 1859 for *Atilia*. Chenu did not make such a designation. He gave the species as an example which is not a type designation. Such is also the case of Fischer and of Tryon using *C. minor* Scacchi as an example of *Atilia*. Neither of those authors gave a valid designation in spite of the statement of Cossmann, 1901, p. 243. This therefore leaves *Atilia* without a proper designation of one of the seven specific names given by H. and A. Adams in 1853.[462]

The *Atilia* of Cossmann is represented in the Paris Basin Eocene by *A. angusta* (Desh.) and *A. biarata* (Cossmann).

Mitrella (Columbellopsis) parva (H. C. Lea)

Plate 37, figs. 2, 3; Plate 84, fig. 7

Buccinum parvum H. C. Lea, 1841, Amer. Jour. Sci., 40, p. 100, pl. 1, fig. 17; Pace, 1902, Proc. Mal. Soc. Lond., vol. V, p. 118.

[456] Risso, A., 1826, p. 247.
[457] Woodring, W. P., 1928, p. 273.
[458] Bucquoy, E., Dautzenberg, Ph. and Dollfus, G. F., 1882, p. 77.
[459] Art. 30, II, Int. Rules Zool. Nom., 1913.
[460] Pace, S., Mal. Soc. Lond., Proc. vol. 5, p. 42, 1902.
[461] Chenu, J. C., 1859, Tome I, p. 201.
[462] Adams, H. and A., 1853, vol. 1, p. 184.

Columbella turricula Whitfield, 1865, Amer. Jour. Conch., vol. 1, p. 261, pl. 27, fig. 1; Cossmann, 1893, p. 33, pl. 2, fig. 22 non *C. turricula* Sowerby, 1832 fide Dall, 1890, p. 137 questioned by Pace, 1902, ibid, p. 147.

Columbella turriculata (Whitfield) de Gregorio, 1890, p. 111, pl. 8, figs. 31, 32; pl. 8, fig. 28 *B. parvum* under *C. elevata* (Lea); Pace, 1902, ibid, p. 147.

Atilia turricula (Whitfield) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 243.

Astyris parva (H. C. Lea) Dall 1890, p. 137.

nec *Columbella parva* Sowerby, 1844 nec *Columbella parva* Sacco, 1890.

B. testâ sub-turritâ, lævi, politâ sub-crassa; spirâ acutâ; anfractibus—, planulatis; suturis impressis, basi striata; labro intus striato; aperturâ sub-quadrilaterali, cancaliculatâ.

Shell sub-turrited, smooth, polished, somewhat thick; spire acute; whorls —, flat; suture sutures impressed; base striated; outer lip striate within; mouth sub-quadrilateral, channelled.

Length—. Breadth .07 of an inch.

Remarks.—In this shell the outer lip has five striæ, but, as I have only one specimen, I cannot determine whether this is a constant character. The columbella appears plicate, from the continuation of the striæ of the base. There is nothing very remarkable about this little species, although it is sufficiently marked to characterize it as new.—[H. C. Lea, 1841].

Lea's figure of the species is too small to distinguish much about the shell. The description gives the general characteristics.

Through the courtesy of the American Museum of Natural History figures of the type specimen of *Columbella turricula* Whitfield, are included. The shell Whitfield had is the same as *M. parva* (H. C. Lea).

Dimensions.—Height, 4 mm.; greatest diameter, 2+ mm., lectotype.

Lectotype.—No. 13163, Academy of Natural Sciences, Philadelphia, Pa.; No. 5532/1, American Museum of Natural History, New York, N. Y. *Columella turricula* Whitfield, holotype.

Occurrence.—Gosport sand: locality 104.

Mitrella (Columbelliopsis) mississippiensis (Meyer and Aldrich)
Plate 38, figs. 16, 17, 21, 22

Columbella mississippiensis Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. vol. IX, p. 43, pl. II, fig. 17: Pace, 1902, Mal. Soc. Lond., Proc. vol. V, p. 108.

Non *Columbella mississippiensis* Aldrich, 1895, Bull. Amer. Pal., vol. I, No. 2, p. 13, pl. 1, fig. 19, 19a.

Astyris mississippiensis (Meyer and Aldrich) Dall, 1890, p. 137 foot-note.

Mitrella mississippiensis (Meyer and Aldrich) Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, pt. 2, p. 60, pl. 7, fig. 14.

Spire elevated. Whorls nine, slightly convex; the last four with an impressed line along the suture. Base of body whorl spirally striated. Columella excavated, anteriorly with three tubercles. Outer lip thickened, crenulated within by about seven striæ, of which one in the middle is the largest.

Newton.—[Meyer and Aldrich].

The specimen from Hickory, Miss., figured herein has been compared with the holotype. It is typical.

The specimen which Aldrich figured (1895) from Woods Bluff, Ala. has been examined. It is not this species but a new form described here as *M. mississippiensis meyeri*, n. var.

Dimensions.—Height, 12.5 mm.; greatest diameter, 7 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 136, 707, 728, 731, 741 and 770.

Mitrella (Columbelliopsis) mississippiensis meyeri, new variety

Columbella mississippiensis Aldrich, 1895, Bull. Amer. Pal., vol. 1, No. 2. p. 13, pl. 1, figs. 19, 19a non *C. mississippiensis* Meyer and Aldrich. 1886.

This form is clearly ancestral to *M. mississippiensis*, the lower Claiborne species.

The species is like *M. mississippiensis* in shape and character of sculpture except that the canal is longer and the aperture narrower, in *meyeri*. There are 5, spiral lines on the basal portion of the body whorl. On the young specimen of *meyeri* there are 6, smooth whorls and the body whorl is covered with spiral lines over the whole surface, strong on the upper and lower part, obscure on the middle. In *M. mississippiensis* there are only one or two spiral ribs just below the suture. This is constant at the several localities where it is found. However, at Orangeburg, S. C., two specimens which have had the outer surface worn reveal beneath fine, spiral lines over the whole surface of the body whorl as the young specimen of *meyeri*.

In the development of this species ontogenetically the spiral ribs become obscure and disappear over the midregion of the shell. This is borne out phylogenetically in that in the later development the ribs have become obsolete.

Dimensions.—Height, 13 mm.; height, 6 mm., respectively syntypes.

Syntypes.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Sabine Eocene: Woods Bluff, Ala. (Aldrich).

Mitrella (Columbellopsis) elevata (Lea) Plate 37, fig. 11; Plate 84, fig. 4

Fasciolaria elevata Lea, 1833, p. 143, pl. 5, fig. 143; H. C. Lea, 1848, p. 99; Conrad, 1865, p. 23 with a question; Harris, 1895, p. 18; Pace, 1902, Proc. Mal. Soc. Lond., vol. V, p. 79.

Columbella elevata (Lea) de Gregorio, 1890, p. 111, pl. 8, figs. 29, 30 included *B. parvus* H. C. Lea and a new variety *incunctabilis* de Gregorio; Cossmann, 1893, p. 33, pl. II, fig. 20.

Atilia elevata (Lea) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 243.

Cerithium misgum de Gregorio, 1890, p. 118, pl. 10, fig. 29; Dall, 1892, p. 277 *Astyris.*

Shell subfusiform, turrited, transversely striate on the inferior part of the last whorl; suture linear; whorls—, slightly convex, truncate along the suture; columella with three or four indistinct folds; canal short, slightly reflected; mouth ovate; outer lip sharp, within crenate.

Length . . . Breadth 3-20ths, of an inch.

Observations.—This species differs very much from the last described. [*F. plicata*]. It is more elevated, without folds, has a smaller mouth, and is striate only on the lower part of the whorl. A single individual only was obtained, the apex of which is broken.—[Lea, 1833].

Specimens of this species and *C. parva* (H. C. Lea) are contained in the Harris collection. The Meyer drawings of the lectotypes of each are included herein. The drawings show a slight crenulation on the inner lip of both. Lea speaks of folds on the columella of *elevata.* Cossmann, (1893, p. 33), states that such folds do not exist. De Gregorio made a new variety *incunctabilis* on the lack of the folds. The specimens in the Harris collection have distinct folds on the columella. If the absence or presence of distinct columellar folds were a constant character in the species, it would be worthy of more than varietal rank. Until an abundance of material is examined to prove the point, the author does not believe the varietal name is necessary and has united it with the species.

De Gregorio united *C. parva* and *elevata.* They are generically alike but *parva* appears to have a shorter spire and the sides of the whorls are more acute.

The fragment which De Gregorio named *Cerithium misgum* appears suspiciously like *M. elevata.* Dr. Dall believed in an affinity of the pecimen with the Columbellidæ as his note of 1892 indicates.

Dimensions.—Height, 9.5 mm.; greatest diameter, 4 mm., holotype.

Holotype.—No. 5747, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Subgenus **CLINURELLA** Sacco, 1889[463]

Genotype here designated, *Columbella* (*Clinurella*) *scalaris* Sacco. Miocene. Italy.

Cossmann placed *Clinurella* Sacco in part equivalent to *Atilia* H. and A. Adams. As has been discussed before, Cossmann's type designation of *Atilia* is not valid. *Clinurella* has the labium smooth and the labrum crenated.

Mitrella (Clinurella) bucciniformis (Heilprin) Plate 38, figs. 7, 9, 10

Pisania bucciniformis Heilprin, 1879, Acad. Nat. Sci., Phila., Proc., vol. 31, p. 213, pl. 13, fig. 7.

Chrysodomus parbrazana Harris, 1895, Acad. Nat. Sci., Phila., Proc. vol. 47, p. 74, pl. 7, fig. 9.

A fragment only of this, the first described species of true *Pisania* existing in the Eocene formations of the United States has come to my notice. The body-whorl is about 2/5 inch in length, striated on the inferior portion, and with a slightly impressed line beneath the suture; mouth about 3/4 length of body-whorl; canal almost obsolete; columella arcuate, wrinkled at base; outer lip striated within by about seven elevated ridges.

Length ?.

Claiborne, Ala.

The *Pisania Claibornensis* of Whitfield (Am. Journ. Conchol., vol. i., p. 259) appears from the description and figure to be more nearly related to Triton.—[Heilprin, 1879].

The Meyer drawing of the holotype is included herein. Heilprin's shell came from the Gosport sand. The lower Claibornian form called *Chrysodomus parbrazana* by Harris from Texas is apparently the same species. It occurs abundantly in the material from the Orangeburg region, South Carolina. It is rare in the Gosport sand. Heilprin had a fragment and there is a single broken specimen in the Harris collection. The shell differs from *M. elevata* and *M. parva* in having a broader body whorl and lacking the plications or striations on the columella.

The species differs from *M. mississippiensis* to which the body whorls bears a striking resemblance, by being considerably more elevated.

Dimensions.—Height, 5.5 mm. (fragment) ; greatest diameter, 4.5 mm., holotype.

[463]Sacco, F., I Molluschi dei terreni terziarii del Piemonte e della Liguria, pt. VI, p. 44, 1890. First species given, p. 44, pl. II, fig. 50.

Holotype.—No. 10267/1, Cat. No. 5559/1 American Museum of Natural History, New York, N. Y. Holotype *C. parbrazana* Harris, formerly Univ. Texas, Geol. Dept. Probably lost.

Occurrence.—Lower Claiborne: localities 707 and 708; Texas (Harris). Gosport sand: locality 104 (type).

Mitrella (Clinurella) casteri, new species Plate 38, figs. 13-15, 18

Shell medium; nucleus consists of two, smooth whorls, nuclear whorls flattened above; post-nuclear whorls five; shell smooth except for spiral lines over the base of the body whorl; inner surface of the labrum striated; columella smooth; immature specimens have midregion of the body whorl angulated.

This species differs from *M. mississippiensis* in having a higher spire. It is not so slender as the other species of *Clinurella* of the Clabornian. It differs from *M. bucciniformis* (*parbrazana*) (Heilprin) in lacking spiral lines below the suture.

The species is named in honor of Dr. Kenneth E. Caster, University of Cincinnati, Cincinnati, Ohio.

Dimensions.—Height, 10.5 mm.; greatest diameter, 6 mm.

Holotype.—No. 3032; paratypes Nos. 3030, 3031 and 3033, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 707 (type) and 741.

Subgenus **BASTROPIA** new subgenus

Genotype *Astyris bastropensis* Harris. Lower Claibornian Eocene. Texas.

Shell elongate, height of the spire greater than the height of the body whorl; nucleus consists of three smooth whorls; fourth whorl and sometimes part of the fifth whorl have pronounced, longitudinal ribs which may or may not be crossed below the suture by a spiral line; some whorls have a spiral line just above the suture; basal portion of the body whorl is spirally striated; columella straight not plicate; labrum probably smooth but the character is uncertain as all the specimens have the margin of the labrum broken.

The smoothness of the inner and outer lips is similar to the condition in *Astyris* H. and A. Adams[464] but the shape is not typical. The character which separates the group from the other genera of *Mitrella* is the presence of the plicate condition on the first whorls of the post-nuclear whorls with the reversion to a smooth condition on the later whorls. The ribbed stage of development may be a relationship with *Anachis*.

Mitrella (Bastropia) bastropensis (Harris) Plate 37, figs. 1, 7

Astyris bastropensis Harris, 1895, Acad. Nat. Sci., Phila., Proc., vol. 47, p. 74, pl. 8, fig. 2; Pace, 1902, Proc. Mal. Soc. Lond., vol. V, p. 59.

Ptychatractus bastropensis (Harris) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 53, fig. 17 *Fusus bastropensis* used in error non *F. bastropensis* Harris, 1895, l. c., p. 71.

General form and size as indicated by the figure; whorls 10; 1, 2, 3 smooth and polished; 4 costate; 5-9 smooth and polished, sometimes one spiral line at base of 8 and 9; body whorl smooth above the upper terminus of the aperture, strongly striate below.

The general outline of the shell is strikingly like that of *Turricula polita*.

Locality.—Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Cossmann placed this species in *Ptychatractus* Stimpson, 1865[465]. The form does not have the plicate columella as in that genus. The slight crenulations on the columella of this species are merely where the spiral ribbing of the body whorl shows through a thin callus.

Prof. Harris mentions that in the outline the species resembles "*Turricula*" *polita* (Gabb)=*Fusimitra polita* (Gabb). The two species have a striking superficial resemblance but differ by the presence of plications on the columella of *polita*. Plications do not occur on *B. bastropensis*. Longitudinal ribs occur on the first two post-nuclear whorls of *bastropensis* while longitudinal ribs do not occur on *polita*. Further notes on the species are given under the generic description.

Dimensions.—Height, 21 mm., holotype.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 136, 723, 727, ?728 and 733 (type).

[464] Adams, H. and A., 1853, vol. I, p. 187.

[465] Stimpson, Wm., Amer. Jour. Conch., vol. 1, p. 59, 1865. Genotype *P. ligatus* (Mighels and Adams). Living. Northeastern North America.

Genus ANACHIS H. and A. Adams, 1853[466]

Genotype by subsequent designation, Tate, 1870,[467] *Columbella scalarina* Sowerby. Living. Panama.

Subgenus ASTYRIS H. and A. Adams, 1853[468]

Genotype by subsequent designation Cossmann, 1901[469] *Columbella rosacea* Gould. Living. Northeastern coast, North America.

Astyris crassus Chavan, new species — Plate 38, figs. 11, 12

Metula crassa Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 167 nomen nudum.

Cette espèce, citée dans les ''Essais de Paleóconchologie comparée'' tome IV, p. 167, 1901, est représentée par deux specimens de la collection Cossmann (No. 6162), provenant de Claiborne (Gosport) et etiquetés: ''*Metula crassa, Cossm.*'' Le plus grand a 9 mm. de longueur, il est un peu usé; l'autre a 6 mm. n'est pas usé mais a l'ouverture abimée, les deux specimens se complètent très bien.

Je n'ai pu trouver trace de la description de ''*Metula crassa*'', dans les nombreuses publications de Cossmann. Cette espèce a visiblement été separée par l'auteur après la parution de sa revision de la faune de l'Alabama et a été oubileé depuis. C'est donc un ''nomen nudum.''

Caractères.—C'est une coquille assez renflée, avec 5 tours dont le dernier occupe environ la moitie de la hauteur totale, que est à peu près 10 mm. pour l'adulte. Surface lisse, sutures rainurées, suivies d'une légère depression surtout visible dans les premiers tours. Columelle droite un peu tordue et à peine ridée, labre avec une très légère gouttière anterieure, et une échancrure analogue à celle d'un *Metula.* Mais de fortes crénelures existent près du bord interne du labre,—pas de varice sur le dernier tour.

Rapports et différences.—Les caractères ci-dessus ne correspondent pas à ceux d'un Metula, dont *M. crassa* differe par sa surface lisse, ses sutures nettement rainurées sa columelle sans bourrelet, un peu ridée,—enfin les crénelures internes du labre, beaucoup plus accusées et bien différentes de celles d'un *Metula* dont *M. decussata* Lamk. *M. tenuilirata,* Cossm. *M. gracilis,* Johnson—, sont des espèces bien caractériseés. Ce n 'est pas non plus un *Laevibuccinum,* Conrad, dont la forme et l'ornementation sont,—à première vue —différents. En fait, *M. crassa* n 'est pas un Buccinidé, mais un Columbellidé à canal court (sous-famille Columbellinae), du genre *Anachis,* sousgenre *Astyris.*

Astyris crassus differe peu d'*A. communis* Conrad, du Miocène de St. Mary's,— comme on peut s'en convaincre en le comparant aux spécimens de cette derniere espèce ou à la figure donnée par Cossmann pour *A. communis* (IV, pl. X, fig. 14-15). Il s'en distingue par sa forme moins allongeé, plus globuleuse et par sa bouche plus grande. C'est la première espèce d'*Astyris,* à ma connaissance, signaleé dans l'Eocène, et peut-être est-ce la première espèce représentative de ce phylum.—[Chavan].

The included description and figures of the species cited by

[466]Adams, H. and A., 1853, vol. 1, p. 184.

[467]Tate, Ralph, Woodward's Man. Mollusca, ed. 2, Appendix, p. 13; ed. 3, Appendix, p. 13, 1875; Pace, S., Proc. Mal. Soc. Lond., vol. V, p. 133, 1902.

[468]Adams, H. and A., 1853, vol. I, p. 187.

[469]Cossmann, M., Essais Pal. Comp., 4 liv., p. 238, 1901.

Cossmann as *Metula crassa* were kindly prepared by Andrè Chavan, Nanterre (Seine) France.

Holotype.—No. 6162, Laboratoire de Géologie de la Faculté de Sciences, Université de Paris (Sorbonne), France.

Genus **METULA** H. and A. Adams, 1853[470]

Genotype by tautonomy[471] *Buccinum metula* Hinds=*M. Hindsii* H. and A. Adams. Living. West Coast Panama.

Metula brazosensis Johnson — Plate 37, fig. 6

Metula brazosensis Johnson, 1899, Acad. Nat. Sci., Phila., Proc., vol. 51, p. 74, pl. II, fig. 1.

Shell subfusiform, whorls six, apical whorl smooth, the three prominent varices are continuous from the body whorl to the smooth apical whorl, between the varices are numerous small longitudinal ribs that become obsolete toward the base of the body whorl, these are crossed by numerous fine revolving raised lines, inner margin of the outer lip but slightly crenulated. Length 8 mm., greatest diam. 3½ mm.

Two specimens collected by the writer from the Lower Claiborne at Black Shoals, Brazos river, Burleson Co., Texas.

The localities, ' Brazos river, about one mile below the Milan-Burleson county line,'' and ''Collier's Ferry, Burleson Co.,'' given by Prof. Harris (Proc. Acad. Nat. Sci., 1895, pp. 73, 78, 79) are the same as Black Shoals. —[Johnson, 1899].

M. sylværupis Harris from the Sabine Eocene of Alabama and the present two species from the lower Claibornian Eocene seem to be the representatives of *Metula* in the southern Eocene. Woodring suggested that the Eocene forms might be separated into subgeneric rank covered by the name *Daphnobela* Cossmann[472].

Holotype.—No. 9833, Academy of Natural Sciences, Philadelphia, Pa.

Metula gracilis Johnson — Plate 37, figs. 10, 16

Metula gracilis Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 75, pl. II, fig. 3.

Metula (*Celatoconus*) *gracilis* Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 167.

Shell slender, fusiform, whorls eight, convex, the three apical whorls smooth, the others cancellated by about 29 revolving ridges on the body whorl, 10 on the spiral whorls and about 38 longitudinal ribs, forming at their junctions small nodules. body whorl with a prominent varix, aperture narrow, contracted at the anterior into a moderate canal, lip thickened, interior with 14 teeth-like ridges. Length 14 mm., greatest diam. 6 mm.

One specimen collected by the writer from the Lower Claiborne, at Alabama Bluff, Trinity river, Houston, Texas.—[Johnson, 1899].

Holotype.—No. 7005, Academy of Natural Science, Philadelphia, Pa.

[470] Adams, H. and A., 1853, vol. I, p. 84.

[471] Woodring, W. P., 1928, p. 285.

[472] Cossmann, M., Essais Pal. Comp., 2 liv., p. 93, 1896, genotype by original designation *Buccinum junceum* Sowerby. Eocene, England.

Genus DENTITEREBRA Meyer, 1887[473]

Genotype by monotypy *D. prima* Meyer. Claibornian Eocene. Alabama.

Dentiterebra prima Meyer Plate 37, fig. 5

Dentiterebra prima Meyer, 1887, Acad. Nat. Sci. Phila., Proc. vol. 39, p. 52, pl. III, fig. 2; Cossmann, 1893, p. 33; Pace, 1902, Proc. Mal. Soc. Lond., vol. V, p. 123.
Columbella (*Dentiterebra*) *prima* (Meyer) de Gregorio, 1890, p. 112, pl. 8, fig. 33.
Anachis prima Dall, 1890, p. 135, section *Seminella*
Cerithium miturum de Gregorio, 1890, p. 118, pl. 10, fig. 27; Dall, 1892, p. 277 *Anachis*.

The pointed nucleus consists of four volutions. Five adult whorls are covered by strong transverse ribs, eighteen on the body whorl; the surface else being smooth. Base with strong revolving lines, which are perceptible on the callus of the inner lip. The inner lip is else without striæ or granulations. Crenulations of the outer lip six. Suture distinct, impressed. *Claiborne, Ala.*

I found only the figured specimen. It has the appearance of a young *Terebra.*—[Meyer, 1887].

The unique species of Meyer belongs certainly in the Columbellidæ. Meyer's genus may fall in synonymy but at present it is retained as distinct. Cossmann observed that the *Cerithium miturum* de Gregorio probably belongs to the species. Such a classification is believed to be correct. The nuclei of the two figures are strikingly alike. Meyer's specimen has more whorls and the body whorl is less enlarged. The difference in the number of whorls might be due to the age of the specimens and the shape of De Gregorio's species might be slightly inaccurate. Dall indicated in his notes of 1892, the Columbellid relationship of De Gregorio's specimen. Both Meyer's and De Gregorio's specimens were young shells.

Holotype.—Formerly at the Geology Department, Johns Hopkins University, Baltimore, Md. Possibly lost.

Occurrence.—Gosport sand: locality 104.

Family NASSARIIDÆ (Nassidæ)[474]

[473]Meyer, O., Acad. Nat. Sci. Phila., Proc. vol. 39, p. 52, 1887.

[474]*Nassarius* Duméril, A. M. C., 1806, p. 166 is now used as a substitute for *Nassa* Lamarck, 1799, non *Nassa* (Bolton) Roeding, 1798, Dall, W. H., 1908, Bull. Mus. Comp. Zool., vol. 43, p. 306 proposed to substitute *Alectrion* Montfort, 1810, for *Nassa*. *Alectrion* is distinct generically from *Nassa*. For further discussion see Woodring, W. P., 1928, p. 264; Iredale, T., 1916, pp. 82-83; Pilsbry, H. A. and Lowe, H. N., 1932, Acad. Nat. Sci., Phila., vol. 84, p. 68.

Genus **BULLIA** Gray, 1834[475]

(*Ancillopsis* Conrad, 1865[476])

Genotype by monotypy *Bullia semiplicata* Gray. Living. Habitat unknown[477].

In 1928[478] the writer not having seen Griffith's Cuvier, 1834, was misled by Cossmann[479] and stated that *Buccinum lævissimum* Gmelin (=*B. lævigata* Martini) was the type of Bullia. Since then the volume on Mollusca, Griffith's Cuvier, has been examined. *Bullia* [also spelled *Bullæa*] is a monotypic genus. The name *Bullia* simply accompanied the figure of *Bullia semiplicata* Gray. *B. semiplicata* is the only species which can be the type. Cossmann, followed H. and A. Adams who apparently used Gray, 1839 where Gray defines the genus as new and includes numerous species.

Bullia altilis (Conrad) Plate 39, figs. 7, 8, 9

Ancillaria altile Conrad, 1832, p. 24, pl. 10, fig. 2; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 96; Harris, 1895, p. 4.
Ancillaria subglobosa Conrad, 1832, p. 25, pl. 10, fig. 3 [partim]; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 96; Harris, 1895, p. 43.
Anolax gigantea Lea, 1833, p. 180, pl. 6, fig. 193.
Ancyllaria altilis (Conrad) d'Orbigny, 1850, p. 352; d'Orbigny, 1850, p. 352 *subglobosa*.
Ancilla altilis Conrad, 1854, Acad. Nat. Sci., Phila., Proc. vol. VII, p. 30; de Gregorio, 1890, p. 55, pl. 3, figs. 21-22, 57, 62, 67.
Ancilla subglobosa Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 30; de Gregorio, 1890, p. 56, pl. 4, figs. 3-4; 19-20 [partim].
Ancillopsis subglobosa Conrad, 1865, p. 22; Conrad, 1866, p. 17 [partim].
Expleritoma prima Aldrich, 1886, Geol. Sur. Ala. Bull., No. 1, p. 29, pl. 5, fig. 1 [pathologic]; de Gregorio, 1890, p. 108, pl. 8, fig. 26-27; Dall, 1892, 371.
Buccinanops altile (Conrad) Cossmann. 1893, p. 33; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 45.
Buccinanops subglobosum (Conrad) Cossmann, 1893, p. 33 [partim].
Buccinanops (*Brachysphingus*) *subglobosa* (Conrad) Cossmann, 1901,

475 Gray, J. E., Alphabetical list of the Figures of Mollusca in Griffith's Cuvier, p. 596, pl. 37, fig. 8, 1834; Gray, J. E., 1839, p. 125 designated as a new genus.
476 Conrad, T. A., Amer. Jour. Conch., vol. 1, p. 22, 1865; Type designation, Cossmann, M., Essais Pal. Comp., 3 liv., p. 45, 1899, *A. altilis* Con.
477 Gray, J. E., 1839, p. 127; Tryon, G., Man. Conch., vol. IV, p. 12, 1882.
478 Price, W. A., and Palmer, K. V. W., Jour. Pal. vol. 2, No. 1, p. 29, 1928.
479 Cossmann, M., Essais Pal. Comp. 4 liv., p. 222, 1901.

Essais Pal. Comp., 4 liv., p. 221, pl. IX, fig. 14 [missprint 23].
Ancillaria subglobosa (Conrad) Harris, 1895, p. 43 [partim].
Bullia altile (Conrad) Palmer, 1928, Jour., Pal., vol. II, No. 1, p. 28, pl. 6, figs. 13, 14, 16 including *subglobosum*.

Obovate acute; body whorl ventricose; spire rather abruptly contracted, subulate towards the apex which is acute; suture obsolete; columella callous, much thickened and projecting above.

Locality.—Claiborne, Alab. Middle Tertiary.

The genus *Ancillaria* appears to be very characteristic of the equivalents of the *London Clay*, most of the known species appertaining to that formation. In the superior beds I have not detected a single species, nor does any exist upon our coast.—[Conrad, 1832].

Conrad described *Ancillaria altilis* and *A. subglobosa*. The two forms have been kept distinct by the later workers. When one examines many specimens from the Gosport sand, *B. subglobosa* appears to be only a variety of the more normal form, *altilis*. *B. subglobosa* has built a greater amount of callus and depressed the spire. The normal shell has the spire exposed and erect. The twisting of the basal portion of the shell to the right which occurs on the specimen Conrad figured for *subglobosa* may be seen on some specimens of *B. altilis*. The evidence which best identifies the two forms as closely related is the character of the young shells. The immature specimens do not show characters distinctive of either form. The young shells have the apex of the spire acute. The spire rises abruptly from the body whorl which is swollen irregularly above.

The forms were placed in the genus *Ancilla* Lamarck (*Ancillaria* Lamarck). The genotype of *Ancilla* is *Voluta ampla* Gmelin. (See under *Ancilla*). That species is a cylindrically oblong shell with the callus on the inner lip below twisted to the left so that the surface of the callus is cut with oblique grooves.

Cossmann placed the species in *Buccinanops* d'Orbigny[480] under the subgenus *Brachysphingus* Gabb[481]. *Buccinum cochlidium Kiener* type of *Buccinanops* has a carinated shoulder on each whorl making a wide sinus at the posterior canal. It is related closely to *Bullia* to which *B. altilis* and *B. subglobosa* are typical.

[480]d'Orbigny, A., Voy. Am. Merid., p. 434, 1841.
[481]Gabb, Wm., Pal. Cal., vol. II, p. 156, 1869. Genotype designated by Cossmann, M., Essais Pal. Comp., 4 liv., p. 221, 1901, *B. sinuatus* Gabb.

Brachysphingus does not have the deep anterior notch as in *B. altilis.*

Aldrich in 1886, described a new genus *Explcritoma* based on one specimen. The specimen Aldrich named *E. prima.* It was from a sandy bed of Claiborne Eocene on Satilpa Creek, Ala. In the Harris collection of Gosport sand material there is a specimen which shows the same character of structure as *E. prima.* It is so like the figure of Aldrich that it might be taken for the specimen figured. The specimen is an injured or diseased shell of *B. altilis subglobosa* (Conrad). Aldrich stated that the "back of the shell looks like a specimen of *Ancillopsis subglobosa* Con." There is no doubt as to the identity of *E. prima* with that species. The callus and outer lip of *E. prima* have been injured and the shell has been partially and irregularly repaired. Dall suggested that the condition of the shell was due to the work of an annelid.

Dimensions.—Height, 37 mm.; greatest diameter, 22 mm., lectotype. Height, 65 mm.; greatest diameter, 45 mm.; lectotype *Anolax gigantea* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; lectoytpe *A. gigantea* Lea, No. 5909, A. N. S.

Occurrence.—Lower Claiborne: locality 778. Gosport sand: locality 104 (type).

Bullia altilis subglobosa (Conrad)
Plate 39, figs. 1, 4, 5, 6, 11, 12; Plate 40, figs. 1-3, 5

The synonymy is given under *B. altilis.*

Subglobose or suboval; spire convex with the tip suddenly exserted and subulate; apex acute; suture obsolete; columella profoundly callous, and projecting in the middle.

Locality.—Claiborne, Alab. Middle Tertiary.

This singular species is perhaps the most ventricose of the genus, but has all the characters of *Ancillaria.* As several individuals were sent among other shells collected at random, they are probably abundant.—[Conrad, 1832].

This form resembles *B. patula* (Deshayes)[482] of the Bartonian Eocene of the Paris Basin. It seems to be more globose and has the spire more depressed than *B. patula.*

[482] Deshayes, G. P., Desc. Coq. Fos. env. Paris, tome II, p. 646, pl. 88, figs. 5, 6, 1835; Cossmann, M. and Pissarro, G., Icon. Comp., pl. 36, figs. 175-1, 1910-13.

The species occurs in the Sabine Eocene. At Hatchitigbee, Ala., the callus thickens posteriorly as in *B. subglobosa* but the shell flattens ventrally and there is a tendency for the callus to develop into large bumps, posteriorly above the posterior notch. The spire is depressed greatly, with the apex protruding as a small point. The type of callus developed is carried to an extreme by forms from the mouth of Gasley Creek, Smithville, Texas, lower Claiborne Eocene. The author described those specimens as a new variety, *B. altilis harrisi* because of the distinct formation which the callus developed.

Dimensions.—Height, 41 mm.; greatest diameter, 34 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; holotype *Expleritoma prima* Aldrich, Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Sabine Eocene. Lower Claiborne: localities 707 and 708. Gosport sand: locality 104 (type).

Bullia altilis harrisi Palmer Plate 39, figs. 2, 3, 10, 13

Bullia altile harrisi Palmer, in Price and Palmer, 1928, Jour. Pal., vol. II, No. 1, p. 29, pl. 7, figs. 7, 11, 15.

Shell small, irregular in shape, flattened ventrally, protruded to the left; the anterior notch is as in *B. altile;* spire is usually depressed and enveloped in the callus; the callus spreads posteriorly and laterally and covers the greater portion of the shell; usually three distinct, large nodes or bumps occur, one on the inner lip just above the middle, one on the dorsal side of the body whorl and one laterally on the middle, left portion of the body whorl. Many specimens have the trinodular character developed strongly and the spire so enveloped in the callus that the true generic identity of the form is obscured. There are specimens which show the anterior notch and groove of *Bullia.*

Named in honor of Prof. G. D. Harris of Cornell University.

Dimensions.—17 mm., height; 14 mm., greatest diameter.—[Palmer, 1928].

Holotype.—No. 360; paratypes Nos. 356 and 357, Paleontological Research Institution.

Occurrence.—Lower Claiborne : localitie 733 and 776 (type).

Bullia scamba (Conrad) Plate 44, figs. 2, 7

Ancillaria scamba Conrad, 1832, p. 25, pl. 10, fig. 4; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 96 ; Harris, 1895, p. 40.

?*Anolax plicata* Lea, 1833, p. 181, pl. 6, fig. 194 young; Harris, 1895, p. 35.

Ancilla scamba Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. 7, p. 30;

de Gregorio, 1890, p. 55, pl. 4, figs. 12-13, 15, 16.
Ancillopsis scamba Conrad, 1865, p. 22; Conrad, 1866, p. 17.
?Olivula ? plicata Conrad, 1866, p. 17.
Ancillina scamba (Conrad) Cossmann, 1893, p. 40.
?Ancillina plicata (Conrad) Cossmann, 1893, p. 40.
Buccinanops (*Bullia*) *scamba* (Conrad) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 223, pl. IX, fig. 14.
?Ancilla (*Olivula*) *plicata* de Gregorio, 1890, p. 57, pl. 4, fig. 9; Cossmann, 1901, ibid, p. 223.

Subulate, turreted; spire elevated; suture obsolete; columella concave and callous; aperture about half the length of the shell and effuse at the base; right lip emarginate at the superior termination; callous at the base elevated and defined by two angular lines.

Locality.—Claiborne, Alab. Middle Tertiary.—[Conrad, 1833].

The callus spreads over the sutural region of the whorls in this species in the same manner as in *Monoptygma lymneoides* (Conrad) the type of the genus *Monoptygma* Lea. The anterior notch is the same in the two species. *Monoptygma* has in all stages of growth the well-developed single plication on the inner lip. On some adult specimens there is a faint intimation of a fold developing on *B. scamba*. A well-developed plication on the columella does not occur in any stage of growth on *B. scamba*. The siphonal notch and fasciole differ in *Monoptygma* from *B. scamba*.

An examination of a young specimen in the Conrad collection reveals conspicuous, longitudinal folds on the apical whorls. They are not so well developed as on *Bullia ancillops*.

Dimensions.—Height, 35 mm.; greatest diameter, 16 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; lectotype, *Anolax plicata* Lea, No. 5910, A. N. S., lost.

Occurrence.—Gosport sand: locality 104.

Bullia tenera (Conrad) Plate 42, figs. 7-13

Ancillaria tenera Conrad, 1834, Acad. Nat. Sci. Phila., Jour. vol. VII, p. 147; Conrad, 1835, p. 42, pl. 16, fig. 5; Harris, 1895, p. 45.
Ancillopsis tenera Conrad, 1865, p. 22; Conrad, 1866, p. 17; H. C. Lea, 1848, p. 96.
Ancilla tenera Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 30; de Gregorio, 1890, p. 56, pl. 4, fig. 2.
Ancillaria prœtenuis labelled specimen A. N. S. Phila.

Thin, ventricose; spire turrited; whorls angular and plicated at the summit; aperture large, effuse; columella much arcuated.

Locality.—Claiborne, Alab. Allied to *A. scamba*, nob. rare.—[Conrad, 1835].

"*Anolax plicata*" Lea may be the young of this species instead of the young of *B. scamba* Conrad where it is placed with doubt.

The holotype has a label in Conrad's handwriting "Ancillopsis praetenuis Conrad". Another label has "Ancillopsis tenera Con." The holotype is a perfect specimen. It was photographed by Miss Helen Winchester, of the Academy of Natural Sciences, Philadelphia, and is included herein.

There is considerable variation in the shape of the shells and in the amount of crenulations on the shoulder. Specimens are figured herein to show change in form and callosity. Apparently as the form becomes more elevated with age the crenulations become hidden by a thin callus spread over the spire.

Dimensions.—Height, 32 mm.; greatest diameter, 14.5 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: 138 and 766. Gosport sand: locality 104 (type).

ANBULLINA, new subgenus

Genotype *Ancillaria ancillops* Heilprin. Eocene. Texas.

Nucleus consists of one and a half whorls, smooth, rounded; nuclear whorl rather flatly convex; first three or four post-nuclear whorls longitudinally ribbed, the ribs become obsolete on the later whorls of the spire and the body whorl; a well-marked band below the suture striated with sigmoidal lines of growth; shell elongate with the spire elevated; siphonal fasciole well marked with a sharp margin sunken below, forming a false umbilicus; anterior notch deep.

This form differs from *Bullia Gray* s. s. in the character of the band below the suture, the presence of the plications on the apical whorls and the groove in the umbilical area.

Bullia (Anbullina) ancillops (Heilprin) Plate 40, figs. 4, 6

Ancillaria ancillops Heilprin, 1891, pp. 398, 406, pl. XI, fig. 4.
Bullia (*Buccinanops*) *ancillopsis* Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 223, pl. IX, fig. 24.

Shell smooth, fusiform, having much the appearance of *Oliva Alabamensis;* whorls strongly convex, the first four or five prominently ribbed; subsutural band, with sigmoidal lines of growth, well marked; aperture broad, about one-half the length of shell; columella surface markedly concave, with a pseud-umbilicus; basal notch profound.

Length somewhat more than an inch.

Smithville, Bastrop Co.

The reverse of this shell has much the aspect of *Oliva Alabamensis*.—[Heilprin, 1891].

The nucleus of the species has been described under the generic description.

The type locality of this species is Smithville, Texas. Thus far it has been found there only.

Dimensions.—Height, 38 mm.; greatest diameter, 15 mm.

Holotype.—Not found.

Occurrence.—Lower Claiborne: localities 733 and 767.

Genus BULOVIA, new genus

Genotype *Bulovia weisbordi* Palmer. Eocene Texas.

Shell slender, *Oliva*-shape; surface smooth; suture of the whorls of the spire covered with a broad callus; sutural callus of the body whorl has a deep groove; parietal callus wide and spreads to the suture of the body whorl; wide band below the suture as well as a band or oblique line above the siphonal fasciole; anterior notch cut deep and wide.

The genus differs from *Bullia* Gray in having the calloused sutures with the grooved suture of the body whorl and the line or band above the siphonal fasciole.

Bulovia weisbordi, new species — Plate 40, figs. 10, 11

There is only one specimen of this species in the Harris collection. It is a perfect specimen except for the nucleus. The description of the species has been given under the genus. The specimen is unique combining characters from several genera. The grooved callus of the suture is like that of *Agaronia alabamensis* (Conrad) but the form differs from that species in having only the suture of the body whorl grooved. It also differs in having the wide band below the suture, in having a wider anterior notch and in lacking the coarsely striated columella and siphonal fasciole.

The species is named in honor of Norman E. Weisbord who has done considerable unpublished work on the Jackson Eocene.

Holotype.—No. 3048, Paleontological Research Institution.

Dimensions.—Height, 22 mm.; greatest diameter, 9 mm.

Occurrence.—Lower Claiborne: locality 733.

Genus **BUCCINANOPS** d'Orbigny, 1841[483]

Genotype by subsequent designation, Gray, 1847,[484] *Buccinum cochlidium* Kiener. Living. Brazil to Patagonia.

Buccinanops calli Aldrich Plate 40, figs. 7, 9

Nassa calli Aldrich, 1886, Geol. Sur. Ala., vol. 1, No. 1, p. 27, pl. 5, fig. 5; Cossmann, 1901, Essais Pal. Comp., IV, liv., p. 202.

Nassaburna calli (Aldrich) de Gregorio, 1890, p. 108, pl. 7, fig. 62, a, b.

Shell oblong-ovate; spire elevated; whorls seven, shouldered, and rounded at suture, with a number of revolving lines just below central part of body whorl; smooth, with five or six striations on the base. Aperture oblong-ovate; labrum crenulate within; a strong fold on the columella at the anterior end of aperture, a number of crenulations above this within the opening.

A thick, well-defined callus spreading over the body whorl, thicker posteriorly.

Locality.—Lisbon, Ala.

Named in honor of my friend Prof. R. E. Call, of the State University at Columbia, Mo.—[Aldrich, 1886].

The species is known so far only by the holotype which is broken. De Gregorio placed the species in the genus *Nasseburna* which he originated (1890). The type *Nassa mutabilis* (Linné) is the type of *Nassarius* Duméril.=*Nassa* Lam. so that *Nasseburna* is eliminated in synonymy.

Dimensions.—Height, 31 mm.; greatest diameter, 18 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Lisbon, Ala. (Aldrich).

Doubtful Species

Buccinum (*Buccinanops*) *priamopse* de Gregorio, p. 107, pl. 8, fig. 22-23 supposedly came from Claiborne. The collections studied have not revealed anything of a similar nature. The holotype would be at the De Gregorio home, Via Mola 132, Palermo, Sicily.

Genus **LISBONIA** new genus

Genotype *Ancillaria expansa* Aldrich. Claibornian Eocene. Alabama.

Spire elevated in young with longitudinal folds on the apical whorls. Indented area below the suture with retral growth lines The characters as described are also typical of *Anbullina*. Adult

[483]d'Orbigny, A., Voy. Am. merid., p. 434, 1841.
[484]Gray, J. E., 1847, p. 139.

whorl large, globose. The longitudinal folds present obscurely on the first post-nuclear whorls. The indentation below the suture becomes obliterated, the retral lines of growth curve posteriorly but the area is shortened.

Further discussion of the genus given under *L. expansa.*

Lisbonia expansa (Aldrich) Plate 40, figs. 8, 12, 13

Ancillaria expansa Aldrich, 1886, Geol. Sur. Ala., vol. I, p. 28, pl. 5, fig. 11.

Shell large, ovate, flattened above; whorls about seven, spire moderate; the youngest whorls encircled by a row of tubercles; suture impressed, covered with a thin callus. Upper whorls and the upper third of the body whorl flattened, then rather abruptly rounded and regularly diminishing toward the base, where it is bounded by a large basal groove.

Aperture oblong-ovate; outer lip thick, a callosity at the posterior; columella smooth, covered with callus, and somewhat twisted. No umbilicus; no sulcus visible.

Locality.—Lisbon, Ala.

Faint traces of revolving color lines remain.—[Aldrich, 1886].

This is an interesting species, rivalling in size *B. altilis* Conrad. The collection contains young and adult specimens. The adult specimens of the two species appear alike. The whorls of the spire not including the penultimate whorl have fine conspicuous, longitudinal ridges. These do not appear on the young and medium sized *B. altilis* and its forms. The life histories of the two species are different and show that the two belong to different genera.

The holotype which is a large specimen but considerably smaller than the largest in the Harris collection, has longitudinal nodes and fine, spiral lines on the apical whorls. This indicates that the small specimens associated with the large, globose form, are young.

The young specimens are strikingly similar in character to *Anbullina ancillops.* Most indicative of a relationship is the subsutural demarcation in which the retral lines of growth are conspicuous, the longitudinal folds on the apical whorls and the columella region. The young of *expansa* does not develop the false umbilicus. *Lisbonia* ontogenetically and phylogenetically has continued in development beyond that of *Anbullina* and developed a large, globose shell with a large, columellar callus and lost the indentation along the retral indentation of the growth lines below the suture. The old specimens will show the retral lines at the posterior margin of the aperture but the longitudinal area is shortened.

Dimenions.—Height, 50 mm.; greatest diameter, 40 mm.; holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: locality 734.

Genus MONOPTYGMA Lea, 1833[485]

Genotype by subsequent designation, Cossmann, 1899[486], *M. lymneoides* (Conrad) (=*M. alabamiensis* Lea). Eocene. United States.

The genus *Monoptygma* Lea is taken from the Olividæ where it has been formerly placed, as allied to *Ancilla*. The columella is smooth as in *Bullia* and it does not have the anterior fold with the small, slash-like plications on it as in the Olividæ.

The affinities of the group seem to be with *Bullia* of Nassariidæ.

Monoptygma lymneoidies (Conrad) Plate 38, figs. 19, 20; Plate 85, figs. 3, 7

Ancillaria lymneoides Conrad, 1833, p. 44; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 42, pl. 16, fig. 6; H. C. Lea, 1848, p. 96; Harris, 1895, p. 26.

Monoptygma alabamiensis Lea, 1833, p. 186, pl. 6, fig. 201; Conrad, 1865, p. 22; Conrad, 1866, p. 17, de Gregorio, 1890, p. 58; pl. 4, fig. 10.

Ancilla lymneoides Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 30.

Monoptygma lymneoides Conrad, 1865, p. 23; Conrad, 1866, p. 17; de Gregorio, 1890, p. 56, pl. 4, fig. 14.

Monoptygma limneoides (Conrad) Cossmann, 1893, p. 41; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 71, pl. III, figs. 24-25.

Subulate, with an elevated fold on the centre of the columella; labrum somewhat expanded.—[Conrad, 1833].

Shell smooth, with a prominent acute spire, and a large fold on the middle of the columella; aperture effuse.

Syn.—Monoptygma alabamiensis *Lea, Con. p.* 186, *p.* 6, *f.* 201.

Locality.—Claiborne, Ala.

This shell agrees with *Ancillaria* in every character but the fold; if this is sufficient for generic distinction, the *Conus sauridens,* nob. should be made the type of a new genus for the same reason. Lea's second species of *Monoptygma* is an *Actaeon.*

No. 4, first edition, p. 44.—[Conrad, 1835].

The sutures are obscure. A callus extends from the columella

[485]Lea, 1833, p. 186.

[486]Cossmann, M., 1899, Essais Pal. Comp., 3 liv., p. 71.

and the suture of the body whorl to about two-thirds the height of the preceding whorl. This species attains a fairly large size. It is not abundant.

Dimensions.—Height, 39 mm.; greatest diameter, 17 mm., lectotype. Height, 12 mm.; greatest diameter, 5.5 mm., holotype *M. alabamiensis* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5929, A. N. S., holotype *M. alabamiensis* Lea.

Occurrence.—Gosport sand: locality 104.

Monoptygma leai Whitfield Plate 38, figs. 1, 2, 6, 8

Monoptygma Leai Whitfield, 1865, Amer. Jour. Conch., vol. 1, p. 261, pl. 27, fig. 7; Aldrich, 1887, Cincinnati Soc. Nat. Hist., vol. X, No. 2, p. 80.

Shell of medium size, with an elevated pointed spire; volutions about five, ventricose above, and attenuate below; suture distinct or slightly channelled; columella a little twisted in the lower part, with a strong, slightly oblique fold above the middle; aperture nearly three-fifths of the entire length of the shell, deeply notched at the anterior end; surface marked by a line of small nodes just below the suture, most distinct on the upper parts of the shell.

Dimensions.—Length of medium-sized specimen. 8 inch, transverse diameter of body volution .35 inch.

This species differs from any species of the genus heretofore described, in the possession of the revolving line of nodes on the upper margins of the volutions.

Locality.—Vicksburg, Miss. Upper Eocene.—[Whitfield, 1865].

This form of *Monoptygma* is beautiful and distinct. It reaches a size much greater than described by Whitfield. The Harris collection contains a fragment which measures an inch and a half in height. Aldrich had in his collection a specimen two inches long. Whitfield gave the species as from Vicksburg. Aldrich published the correction as to locality in 1887. The Harris collection includes specimens from Lisbon, Ala.

Through the courtesy of A. W. Slocum, Walker Museum, University of Chicago, illustrations and measurements of the holotype are herein included.

Dimensions.—Height, 19.0 mm.; width, 10.2 - 13.0 mm. (measured at right angles and parallel to aperture), holotype.

Holotype.—Cat. Nos. Whit. 1218, U. C. 24671, Walker Museum of Paleontology, University of Chicago.

Occurrence.—Lower Claiborne: locality 734 (type).

Monoptygma crassiplica Conrad in Gabb Plate 38, figs. 3-5

Monoptygma crassiplica Conrad, MS. in Gabb, 1860, Acad. Nat. Sci. Phila., 2d. ser., Jour. vol. IV, p. 384, pl. 67, fig. 37.

Fusiform, moderately thick, aperture rather narrow; fold on the columella thick and elevated.

Dimensions.—Length 1 in., width of body whorl .5 in., length of mouth .55 in.

Locality.—Wheelock, Texas.

"It is interesting to find a second species of this genus with a more prominent fold than the typical shell. It confirms the propriety of separating the species from those of *Ancilla*, and the genus Monoptygma may now be regarded as of Eocene origin and probably does not occur in the upper tertiaries."—Conrad, MMS.—[Conrad in Gabb, 1860].

A specimen in the U. S. Nat. Museum from Holstein's well, 5 miles southeast of Gibbsland, Bienville Parish, La. was drawn by G. D. Harris for his Texas Eocene MS. The illustration is included herein.

There is a worn specimen in the Academy of Natural Sciences of this species. It is labelled "Smith, Inst. Texas".

Dimensions.—Height, 19 mm.; greatest diameter, 10 mm., A. N. S. specimen.

Holotype.—Probably lost. Specimen, No. 13274, A. N. S.

Occurrence.—Lower Claiborne: localities 733, 735 and 766.

Monoptygma curta Conrad Plate 85, fig. 8

Monoptygma curta Conrad, 1865, pp. 22, 143, pl. 11; fig. 8; Conrad, 1866, p. 17; de Gregorio, 1890, p. 58, pl. 4, fig. 11; Harris, 1895, p. 14.

Subelliptical; spire short, the volutions slightly convex, indented at the suture; body volution ventricose, abruptly rounded above, near the suture; aperture patulous; columella with a prominent acute fold, and tortuous and obtusely carinated towards the base; basal margin wide.

Locality.—Claiborne, Alabama.—[Conrad, 1865].

This species is known only by the holotype. The holotype differs from the young of *M. lymneoides* in being broader and shorter.

Dimensions.—Height, 11 mm.; greatest diameter, 6 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala. (Conrad).

Genus **DORSANUM** Gray, 1847[487]

Genotype by original designation, *Buccinum politum* Lamarck. Living. Indian Ocean.

[487]Gray, J. E., 1847, p. 139.

Section **SAGENELLA** Conrad, 1865[488]

Genotype by monotypy *Phos bellaliratus* Gabb. Eocene. Alabama.

Conrad gave the name *Sagenella* to two species.

The second, *S. texana* Conrad (non *Phos texanus* Gabb) is a nomen nudum. Conrad did not give a figure or description of the species as he probably intended to from the reference given. The first species *S. bellalirata* (Gabb) is therefore left as the monotype of the group. *S. bellalirata* was given a thorough description by Gabb, although not figured. The species has not been found apparently by later authors. According to Gabb's description of the species the generic characters consist of lack of varices, labrum striated within, smooth columella with a plication or fold on the truncated margin of the columella and deeper and more oblique notch than *Buccitriton* Conrad.

The single plication at the termination of the columella suggests a shell like *Dorsanum* Gray. Because of a certain indefiniteness as regards the characters of the two groups Conrad's group is placed under *Dorsanum*. Formerly *Sagenella* Conrad has been placed as synonymous with *Buccitriton* Conrad. The two groups differ in the character of the nucleus, if one compares the nucleus of *D. scalatum* (Heilprin) with the nucleus of the type of *Buccitriton*. The canal, columella fold and anterior notch differ in the two groups.

Dorsanum bellaliratus (Gabb) Plate 41, fig. 1

Phos bellaliratus Gabb, 1861, Acad. Nat. Sci. Phila., Proc., vol. 13, p. 367.
Sagenella bellalvirata Conrad, 1865, p. 21 [misspelled]; Conrad, 1866, p. 18.
Buccinum (*Buccitriton*) *bellaliratum* (Gabb) de Gregorio, 1890, p. 104.
?*Buccinum* (*Nassa*) *confiscatum* de Gregorio, 1890, p. 106, pl. 8, fig. 20-21.

Shell robust; spire elevated, whorls eight. First three smooth and polished, subsequent ones marked by numerous longitudinal angulated ribs, of which there are about twenty on the body volution. Between them, the interspaces are regularly concave. These are crossed by revolving lines, about fifteen to eighteen on the body whorl, nine or ten of which are visible on the preceding ones. Suture small but distinct, and bordered by a prominent, undulated rib; the whole surface of the shell being crossed by well marked lines of growth. Mouth short, rather wide. Outer lip acute on the edge, thickened behind and internally striate. Inner lip covered with a thick coat of enamel, smooth and polished. Canal short, deeply notched and with a large fold on the truncated edge of the columella.

Length, .6 in.; width of body whorl, .3 in.; length of mouth, .24 in.

From the Eocene of Claiborne, Ala. Coll. Acad.

[488]Conrad, T. A. 1865, p. 21 misspelled, corrected on p. 191.

From *P. Texanus,* nob., the nearest allied form, this species can be distinguished by the more robust shape, lower spire, absence of the occasional tendency to form pseudo-varices, or periodical arrests in growth; the broader mouth and the perfectly smooth columellar lip, which, in the latter species, is marked by a few irregular polished thickenings or teeth. The notch, at the end of the canal is deeper and more oblique, the longitudinal ribs are more prominent, acute, fewer in number and placed further apart. *P. Texanus* has distinct revolving ribs; in the present species there are mere imbrications, abrupt above and sloping anteriorly to the edge of the succeeding ones; except near the canal, where the last two or three take the form of ribs.—[Gabb, 1861].

This species was never figured. Through the kindness of Miss Helen Winchester of the Academy of Natural Sciences, Philadelphia, an illustration of the holotype is included herein.

The holotype is marked "Gabb ?" and "Claiborne?"

The specimen is good and has coarse ferruginous sand in the aperture.

The nucleus is broken. The whorls are not shouldered so much as *B. sagenum* or *D. scalatum.* The surface is covered by flat, spiral ribs with linear interspaces. There are about 9, spiral ribs on the penultimate whorl crossed by longitudinal folds which are pinched into nodes just below the suture, with a groove between the suture and the nodes. The outer lip and anterior margin of the inner lip are broken. The notch is short. There is a plication on the parietal callus opposite the nodose margin of the outer lip.

Dimensions.—Height, 18 mm.; greatest diameter, 9 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—? Gosport sand: Claiborne, Ala.

Dorsanum scalatum (Heilprin) Plate 41, figs. 5, 10

Buccitriton scalatum Heilprin, 1891, pp. 399, 405, pl. XI, fig. 5.

Shell small but robust; spire of about seven volutions, prominently turreted or scalariform; whorls only feebly convex, flattened on the shoulder and carrying a considerable number of sharp, diagonally directed ribs which become obsolete on the bodywhorl; revolving lines well-defined on the base of the bodywhorl; elsewhere almost obsolete; the flat shoulders with two impressed lines, the upper of which is the most prominent. Aperture bucciniform (or columbellæform), about one-half the length of shell; outer

lip thickened near the border.
Length, one-half inch.
Smithville, Bastrop Co.
This species differs from the *Buccitriton sagena*, of Conrad in its high and flat shoulder, in the less prominence of the revolving lines, and in the obliteration of the longitudinal folds on the body-whorl.—[Heilprin, 1891].

Nucleus consists of two and a half to three, smooth whorls, first whorl minute, others rapidly increasing, globose; post-nuclear sculpture begins with longitudinal ribs; longitudinal ribs are prominent over the whorls of the spire but die out on the last of the penultimate whorl and on the body whorl; there is a spiral cord just below the suture and the whorls are shouldered below the cord; longitudinal ribs are nodose at the shoulder; lower part of the body whorl striated; a single plication on the columella at the anterior margin and the border of the notch.

Heilprin classified his species as *Buccitriton*. The species has an entirely different nucleus and there is a short canal. In *Buccitriton* the anterior region is short and cut with a deep notch. The labrum is crenulated on the inside in *Buccitriton*. In *D. scalatum* the labrum is thickened within but not crenulated. This latter character is a feature not to be considered seriously for the crenation on the inner labrum in many of these forms is a variable character. An adequate collection of *scalatum* is not available to say whether the character may be a constant feature. The type of *Sagenella* has the labrum crenated within. The nucleus of *Dorsanum* has not been accessible. The species is placed in the genus because of the similar aperture including the single plication on the lower columella. The description of the columella fold and anterior notch of *Sagenella* agrees with that found in *D. scalatum*.

Dimensions.—Height, 15 mm.; greatest diameter, 7 mm.

Holotype.—Not found[489].

Occurrence.—Lower Claiborne: localities 733 and 767.

[489]Search was made in the Academy of Natural Sciences and in the Geology Department, University of Texas, for the type of this species and the types of other new species described in the same report.

Family BUCCINIDAE

Genus LACINIA Conrad, 1853.[490]

Genotype by original designation *Lacinia alveata* Conrad. Claibornian Eocene. United States.

Lacinia alveata (Conrad) Plate 44, figs. 9, 10, 12-14

Melongena alveata Conrad, 1833, Amer. Jour. Sci., 1st ser., vol. 23, p. 344; Conrad, 1835, p. 37, pl. 15, fig. 2; H. C. Lea, 1848, p. 101.

Pyrula Smithii Lea, 1833, p. 155, pl. 5, fig. 162.

Lacinia alveata Conrad, 1853, Acad. Nat. Sci. Phila., Proc. vol. VI, p. 448; Conrad, 1865, p. 21; Conrad, 1866, p. 17; de Gregorio, 1890, p. 112, pl. 9, figs. 1-2, 4-7; Cossmann, 1893, p. 33; Harris 1895, p. 5; Cossmann, 1901, Essais Pal. Comp. 4 liv., p. 156, pl. VI, fig. 5.

Shell subglobose, with revolving striæ; a few of which are distinct; body whorl with a broad channel above; spire very short, columella callous, profoundly so above; basal emargination profound. Length, one and a half inches.

Locality.—Claiborne, Alab. *London clay.*—[Conrad, 1833].

Shell large and robust; solid; apical whorls of the young shells show axial, nodular sculpture which is not present on the adult; three, large concentric ridges occur on the body whorl, with one at the shoulder; the other two occur over the middle portion of the whorl, each widely separated from the other; each of the large ridges consists of two concentric ribs obscurely seen; on the lower part of the body whorl above the basal emargination numerous, medium fine, concentric ribs occur; the umbilical area is rarely indented; anterior notch large and deeply cut.

This species is abundant in the Gosport sand. Prof. Harris, after collecting many times at Claiborne Bluff, discovered one specimen of large size. It measures 115 mm. in height and 87 mm., greatest diameter. With the exception of the broken outer lip, the specimen is well preserved. On the large mature specimens the concentric sculpture tends to become obliterated and the lines of growth more conspicuous.

Dimensions.—Height, 70 mm.; greatest diameter, 60 mm., lectotype. Height 43 mm.; greatest diameter, 30 mm., holotype *Pyrula smithii* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; holotype *Pyrula Smithii* Lea No. 5812, A. N. S.

Occurrence.—Lower Claiborne: locality 776. Gosport sand: locality 104 (type).

[490]Conrad, T. A., Acad. Nat. Sci. Phila., Proc. vol. VI, p. 448, 1853.

Lacinia claibornensis, new species Plate 44, figs. 6, 11

Shell medium, stout and heavy; nucleus worn; whorl of the spire three, each with a row of 10, large, nodes just above the suture; body whorl ornamented with coarse, spiral ribs with wide interspaces; aperture elongated with a narrow posterior groove; labrum crenate within; short anterior canal; indentation in the umbilical area.

This species is a typical *Lacinia* which has been known so far only by the genotype. Only one specimen of this new species has been found.

The holotype is an immature specimen, judging from the change in sculpture from youth to old age in *L. alveata*. A mature specimen of this species would probably be smoother.

L. claibornensis differs from *L. alveata* in being more elongate, having stronger nodes on the spire, and having the spiral ribs over the middle portion of the body whorl, closer together. The crenulations on the interior of the labrum are coarser than usually seen in *L. alveata*. Such crenulations are variable, even within a species so that no importance is placed upon their presence or absence.

Dimensions.—Height, 17 mm.; greatest diameter, 10 mm.

Holotype.—No. 3084, Paleontological Research Institution.

Occurrence.—Gosport sand: locality 104.

Genus **BUCCITRITON** Conrad, 1865.[491]

Genotype by subsequent designation, Cossmann, 1901[492] *Nassa cancellacum* Lea=*Buccinum sagenum* Conrad. Eocene. United States.

Buccitriton sagenum (Conrad) Plate 41, figs. 4, 7, 8, 9

Buccinum sagenum Conrad, 1833, Aug. p. 34; H. C. Lea, 1848, p. 97; d'Orbigny, 1850, p. 369.

Nassa sagena Conrad, 1834, App. in Morton, p. 4.

Nassa cancellata Lea, 1833, Dec. p. 165, pl. 5, fig. 170; H. C. Lea, 1848, p. 102; Harris, 1895, p. 9 nec *N. cancellata* Chemnitz, 1780 nec *M. cancellata* A. Adams, 1851.

Buccinum (*Nassa*) *cancellatum* de Gregorio, 1890, pp. 102, 103; pl. 8, figs. 1-4 including vars. *sapidum* de Gregorio and *molitum* de Gregorio; Cossmann, 1893, p. 33.

Buccitriton sagenum Conrad, 1865, p. 20; Conrad, 1866, p. 17; Harris,

491Conrad, T. A., 1865, p. 20.

492Cossmann, M., Essais Pal. Comp., 4 liv., p. 159, 1901.

1895, p. 39.

Phos (*Buccitriton*) *sagenum* (Conrad) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 159, pl. 6, fig. 11.

Phos sagenum (Conrad) Dall, 1890, pp. 131, 135.

Buccinum (*Phos*) *trimorfopse* de Gregorio, 1890, p. 104, pl. 8, figs. 5-10.

Tritonidea trimorfopse (de Gregorio) Cossmann, 1893, p. 34.

Buccinum (*Nassa*) *prostratum* de Gregorio, 1890, p. 104, pl. 8, fig. 13.

?*Buccinum* (*Nassa*) *impectens* de Gregorio, 1890, p. 105, pl. 8, fig. 15.

Shell conic-acute, with elevated, distinct, acute, costæ, about fifteen of which are on the body whorl, and decussated by numerous regular sligntly elevated transverse striœ; somewhat indented above the shoulder; volutions about eight, the four on the apex nearly smooth; aperture about one-tnird of the length of the shell: right lip striated within. Length 5/8 of an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

The nucleus is composed of four and a half to five and a half smooth whorls, elevated, conical, the first minute, the last very large. The longitudinal ribbing begins on the last portion of the nucleus and soon merges into the transverse ribbing. The collar below the suture and the beaded or finely nodose character of the longitudinal ribs where they are crossed by the transverse, is developed from the beginning of rib development. Below the collar the whorls are shouldered. Between the collar and the shoulder there are fine, spiral lines from two to four in number. One or more rounded varices occur at irregular intervals over the shell, in some cases only back of the margin of the labrum. The varix is an early developed character for it may be seen on young shells. De Gregorio considered the presence of varices of varietal rank but the character is far too constant for such separation.

This species was identified as *Phos*[493] by Dall and so considered by authors. *Buccitriton* is distinct generically from *Phos*. The nucleus of *Phos* consists of two smooth whorls while that of *Buccitriton* consists of four or five with the last two greatly enlarged. Varices in *Buccitriton* are more conspicuous. *Phos* has a well-marked groove with a plication on both margins of the columella, the siphonal fasciole is inflated and there is a posterior groove along the parietal wall. *Buccitriton* lacks the columellar groove and its siphonal fasciole is flattened. The nucleus of *Tritiaria* Conrad, 1865, the type of which is *T. mississippiensis*

[493]Montfort, D., 1810, p. 495. Genotype by original designation *Murex senticosus* Linnæus. Living. Indo-Pacific.

(Conrad) from the Vicksburg Oligocene, is nearer to *Buccitriton* than that of *Phos* is. *Tritiaria* has the columellar region and the siphonal fasciole similar to *Buccitriton.* It has a longer anterior canal and the siphonal notch is not cut so deeply.

This species is abundant in the Gosport sand. Specimens occur which show the transition stages from the young to the adult.

Dimensions.—Height, 17 mm.; greatest diameter, 8 mm. Height, 20 mm.; greatest diameter, 10 mm., holotype *Nassa cancellata* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5841, A. N. S. holotype *Nassa cancellata* Lea.

Occurrence.—Lower Claiborne: localities 707, 708, 723, 724, 726, 728, 734, 741, 743 and 803. Gosport sand: locality 104.

Buccitriton texanum (Gabb) Plate 41, figs. 2, 3, 6; Plate 85, fig. 1

Phos texanus Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d ser., vol. IV, p. 381, pl. 67, fig. 17.

Buccitriton altus Conrad, 1865, pp. 20, 211, pl. 21, fig. 9; Conrad, 1866, p. 17; Dall, 1890, p. 134, *Nassa.*

Buccitriton texanum (Gabb) Conrad, 1865, p. 20; Conrad, 1866, p. 17; Heilprin, 1891, p. 399; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 160.

Phos texanus (Gabb) Dall, 1890, p. 135.

Subfusiform, whorls eight, spire high; mouth small, outer lip with seven or eight teeth inside, inner lip with about six; canal very short, recurved; surface marked by numerous revolving ribs crossed by longitudinal ribs and very indistinct longitudinal impressed lines; the ribs are slightly thickened where they cross on the upper part of the whorl so as to present the appearance of small tubercles or nodes. The young shells, having but three or four whorls, are more robust, polished and coarsely reticulated by distant lines.

Dimensions.—Length .5 in., length of mouth .17 in., width of body whorl .22 in.—[Gabb, 1860].

This species is related to *B. sagenum* (Conrad). The nucleus and sculptural development is similar in the two species. The anterior notch, siphonal fasciole and aperture are alike in both forms. A distinguishing character between the majority of specimens of the two species is the presence of denticles on the inner lip of the adult shells of *texanum.* However they are lacking on young specimens and sometimes on adult. *B. texanum* has the collar below the suture but lacks the shoulder on the whorls as in *B. sagenum.*

The figure of Conrad's *B. altum* is poor and certainly not a true representation of Conrad's description. The holotype is badly worn but does show the cancellations of which Conrad speaks as well as the other characters which identify it as *B. texanum* (Gabb).

This species is abundant in all stages of growth at Moseley's Ferry, Texas.

Dimensions.—Height, 12+ mm.; greatest diameter, 6 mm., holotype *B. altus* Conrad.

Lectotype.—No. 13278, Academy of Natural Sciences, Philadelphia, Pa. Holotype *B. altus* Conrad, is in the A. N. S.

Occurrence.—Lower Claiborne: localities 137, 723, 725, 727, 765 and 766.

Buccitriton mangonizatum (de Gregorio)

Buccinum (*Nassa*) *mangonizatum* de Gregorio, 1890, p. 105, pl. 8, figs. 18-19.

Nassa pleona Aldrich, 1921, Bull. Amer. Pal., vol. IX, No. 37, p. 12, pl. 1, figs. 25, 26.

Testa minuta, elegans, solidiuscula; axialiter costulata, spiraliter funiculata, tenuis; costis potius tenuibus, subcancellatis, vero autem turgidis granulosisque funiculos clathrantibus; funiculis regularibus linearibus, duobus ad anfractum; labro externo intus plicato. L. 8 mm.

Certes, c'est une des plus jolies espèces de Claiborne, dont l'ornementation apparait distinctement sous la loupe. Les côtes son plutôt faibles, mais en rencontrant les cordonnets spirals, qui du reste sont linéaires, deviennent très renflées et presque tuberculeuses; de sorte qu'elles semblent entrecoupées.

J'ai quelque doute qu'on doive référer a cette espèce la *Mesostoma rugosa* Heilpr. dont je parlerai en suite.

Coll. mon Cabinet.—[De Gregorio, 1890].

This species is unique in the Clairbornian fauna having considerably stronger sculpture than any of the related species. The sculpture is so striking that there seems little doubt but that De Gregorio and Aldrich each found the same rare species, each in a different horizon of the Claibornian. However, De Gregorio's specimen may have come from the base of the bluff at Claiborne and not from the "sand."

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily Aldrich syntypes, No. 69, Alabama Museum of Natural History, University, Alabama.

Occurrence.—Lower Claiborne: Lisbon, Ala. (Aldrich).? Gosport sand: Claiborne, Ala. (type).

Genus **TEREBRIFUSUS** Conrad, 1865.[494]

Genotype by monotypy *Buccinum amœnum* Conrad. Claibornian Eocene. Southern United States.

Terebrifusus amœnus (Conrad)

Plate 53, figs. 6, 7, 9, 10, 13, 15, 16; Plate 88, figs. 10, 13, 14

Buccinum amœnum Conrad, 1833, Sept., p. 45; Conrad, 1834, App. in Morton, p. 5; Harris, 1895, p. 5; Pace, 1902, Proc. Mal. Soc. Lond., vol. V, p. 52.

Terebra gracilis Lea, 1833, Dec., p. 166, pl. 5, fig. 171.

Mitra elegans H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, p. 102, pl. 1, fig. 22; de Gregorio, 1890, p. 77, pl. 5, fig. 62 (*Terebrifusus*); Pace, 1902, Proc. Mal. Soc. Lond., vol V, p. 79.

Terebrifusus amœna Conrad, 1865, p. 28; Conrad, 1866, p. 14 *amœnus.*

Mitra (*Terebrifus*) *amœna* (Conrad) de Gregorio, 1890, p. 76, pl. 5, fig. 61 [misspelling].

Buccimitra amœna (Conrad) Harris, 1895, p. 5 no reference probably found as museum label.

Terebrifusus amoenus (Conrad) Cossmann, 1893, p. 37; Aldrich, 1895, Bull. Amer. Pal., vol. I, No. 2, p. 10; pl. 1, fig. 15; Harris 1899, Bull. Amer. Pal., vol. III, No. 11, p. 59, pl. 7, fig. 13; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 161, pl. VI, fig. 12.

Subulate with about six slightly convex volutions; with distant obtuse longitudinal ribs, and acute prominent equidistant spiral striæ; aperture contracted, less than half the length of the shell; base very slightly reflected.—[Conrad, 1833] .

Nucleus consists of about three smooth whorls. The post-nuclear sculpture begins with about a quarter of a whorl with well-developed longitudinal ribs followed by the complete sculpture of the shell which consists of the axial ribs crossed by five, pronounced, spiral ribs with wide interspaces. Typically intermediate spiral lines do not occur on the upper whorls but one intermediate line is usually present on the body whorl. There are eight or more fine but definite plications on the columella depending on the age of the individual. Fewer plications may be found on young specimens.

Conrad does not mention plications or striations on the columella but Isaac Lea speaks of the striate columella in his description of *Terebra gracilis and* H. C. Lea particularly pointed out the folds on the columella of *Mitra elegans.* Both forms are synonymous with *amœnus* of Conrad. The *Terebra multiplicata* of H. C. Lea seems to vary from typical *amœnus* in having the interspaces of the spiral ribs with three fine, spiral lines, the middle of the three the largest. They occur over the whole surface of the shell giving the shell a more finely striated appearance than *amœnus.* The longitudinal ribs are larger. Lea pointed out

[494] Conrad, T. A., 1865, p. 28.

the larger number of plications on the columella. This character is not believed to be constant as the number increases on *T. amœnus.* In the Harris collection there is a specimen from the lower Claibornian, on the Little Brazos, near Stone City, Texas which in character of the sculpture is typical *T. multiplicata* Lea and it has only five plications.

The number of longitudinal ribs varies. This has been illustrated by examples from several localities.

Aldrich and Harris found the species at Woods Bluff, Ala. in the Sabine Eocene.

Dimensions.—Height, 21 mm.; greatest diameter, 8 mm., lectotype. Height, 9 mm.; greatest diameter, 4 mm., lectotype *T. gracilis* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; *T. gracilis* Lea, No. 5847, A. N. S.

Occurrence.—Sabine: Alabama. Lower Claiborne: localities 136, 707, 708 and 725. Gosport sand: locality 104 (type).

Terebrifusus multiplicata (H. C. Lea)

Plate 53, figs. 3,, 8, 11, 14; Plate 88, fig. 4

Terebra multiplicata H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, p. 101, pl. 1, fig. 19; H. C. Lea, 1848, p. 106; Pace, 1902, Proc. Mal. Soc. Lond., vol. V, p. 110.

Mitra (*Terebrifusus*) *multiplicata* (Lea) de Gregorio, 1890, p. 77, pl. 5, fig. 65.

T. testâ sub-turritâ, elongatâ crassâ, transversè striatâ, longitudinaliter costatâ, costis maximis; anfractibus——, valde convexis; suturis impressis; basi striatâ; columella quatuordecim plicis minimis; aperturâ; ovatâ; canaliculo sub-recurvo.

Shell sub-turrited, elongated, thick, transversely striate, longitudinally costate, with very large costæ; whorls ——, very convex; sutures impressed; base striate; columella with fourteen very small folds; mouth ovate; channell small, somewhat recurved.

Length.— ———. Breadth .25 of an inch.

Remarks.—This species much rsembles the *T. gracilis,* Lea, but may be easily distinguished from that shell by the folds on the columella, its larger size, and its more strongly defined ribs. The mouth is .25 of an inch long. Its apex seems to be very fragile, for, although I have several specimens, that figured is the most perfect.—[H. C. Lea, 1841].

This species has generally been regarded as *T. amœnus* (Conrad). The form has been discussed under that species.

Dimensions.—Height, 12 mm.; greatest diameter, 6 mm., lectotype.

Lectotype.—No. 13160, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality 727.

Genus **LÆVIBUCCINUM** Conrad, 1865.[495]

Genotype by monotypy *Buccinum prorsum* Conrad. Eocene. United States.

Lævibuccinum prorsum (Conrad) Plate 44, figs. 5, 8

Buccinum prorsum Conrad, 1833, p. 45; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 97.
Buccinanops prorsum d'Orbigny, 1850, p. 369.
Lævibuccinum prorsum Conrad, 1865, pp. 21, 211, pl. 20, fig. 17; Conrad, 1866, p. 17; de Gregorio, 1890, p. 106, pl. 8, fig. 25; Cossmann, 1893, p. 34; Harris, 1895, p. 36; Cossmann, 1901, Essais Pal. Comp. 4 liv., p. 182, pl. 8, figs. 2, 3 [*Levibuccinum*, locality wrong].
Pisania prorsum Dall, 1890, p. 130 [partim]; separated from *Pisania* on p. 235 of same reference, 1892.
Euthria (*Laevibuccinum*) *prorsum Heilprin*, 1891, p. 398.

Fusiform, with six convex volutions; spirally striated; striæ obsolete on the middle of the whorls; spire subulate; base very slightly reflected; aperture narrow-elliptical, more than half the length of the shell.—[Conrad, 1833].

Nucleus consists of four smooth whorls, the first minute, third and fourth enlarged; first post-nuclear whorls covered with fine, spiral ribs; labrum may be crenate or smooth within.

This species is probably derived from *L. lineatum* Heilprin,[496] (plate 44, figs. 3, 4) of the Midway and Sabine. The adult *L. prorsum* differs from *L. lineatum* in having the penultimate whorl and body whorl smooth in the midregion. But the early post-nuclear whorls of *L. prorsum* are completely striated as in adult *L. lineatum*. The nuclei of the two are the same.

L. prorsum is rare in the sand. Specimens are figured herein showing a difference in crenulation of the interior of the labrum.

Neptunea constricta Aldrich[497] from the Midway Eocene is a less slender species but has a similarity in surface markings which makes the line of origin of *L. prorsum* less certain.

De Gregorio[498] described *Buccinum* (*Laevibuccinum*) *popleum* supposedly from Claiborne. It differs from *L. prorsum* and *lineatum* in having carinated whorls. The holotype would be at the De Gregorio home, Via Molo 132, Palermo, Sicily.

Dimensions.—Height, 22 mm.; greatest diameter, 10 mm., lectotype.

[495]Conrad, T. A., 1865, p. 21.
[496]Heilprin, A., Proc. Acad. Nat. Sci. Phila., Proc. vol. 32, p. 371, pl. 20, fig. 5, 1880; Harris, G. D., Bull. Amer. Pal. vol. I, No. 4, p. 97, pl. 9, fig. 15, 1896; Harris, G. D., ibid, vol. III, No. 11, p. 52, pl. 6, fig. 12, 1899.
[497]Aldrich, T. H., Geol. Sur. Ala., Bull. No. I, pt. 1, p. 24, pl. 5, fig. 13, 1886; Harris, G. D., Bull. Amer. Pal., vol. I, No. 4, p. 97, pl. 9, fig. 14, 1896.
[498]de Gregorio, A., 1890, p. 106, pl. 8, fig. 24.

Lectotype.—Academy of Natural Sciences Philadelphia.

Occurrence.—Lower Claiborne: localities 103, 707 and 708. Gosport sand: Claiborne, Ala. (type), (locality 782).

Genus **PSEUDOLIVA** Swainson, 1840.[499]

Genotype by original designation, *Buccinum plumbeum* Chemnitz. Living. Africa?

Section **BUCCINORBIS** Conrad, 1865.[500]

Type by subsequent designation, Cossmann, 1901 [501] *Pseudoliva vetusta* Conrad. Eocene. United States.

Pseudoliva vetusta (Conrad) Plate 43, figs. 1, 4-8, 11-14

Monoceros vetusta Conrad, 1833, Nov., p. 44; Conrad, 1834, App. in Morton, p. 4; Conrad, 1835, p. 37; pl. 15, fig. 3; H. C. Lea, 1848, p. 101 *vetustum;* d'Orbigny, 1850, p. 369; Harris, 1895, p. 48.

Monoceros pyruloides Lea, 1833, Dec., p. 161, pl. 5, fig. 166; H. C. Lea, 1848, p. 101 *pyruloide.*

Monoceros fusiformis Lea, 1833, p. 162, pl. 5, fig. 167; H. C. Lea, 1848, p. 101 *fusiforme* non Conrad in Gabb, 1860.

Monoceros sulcatum Lea, 1833, p. 163, pl. 5, fig. 168 [young]; H. C. Lea, 1848, p. 101.

Acanthina (*Gastridium*) Conrad, 1853, Acad. Nat. Sci. Phila., Proc. vol. VI, p. 320.

Pseudoliva (*Buccinorbis*) *vetusta* Conrad, 1865, pp. 22, 191, [under *Sulcobuccinum* as synonymous with *Pseudoliva*]; Conrad, 1866, p. 17.

Pseudoliva sulcata (Lea) Conrad, 1866, p. 17.

Pseudoliva vetusta (Conrad) de Gregorio, 1890, p. 109, pl. 8, figs. 41, 45, 46, 47 including var. *fusiformis;* Cossmann, 1893, p. 33; Harris, 1895, p. 48; Harris, 1896, Bull. Amer. Pal., vol. I, No. 4, p. 99, pl. 9, figs. 17; Harris, 1896, Acad. Nat. Sci. Phila., Proc. vol. 48, p. 478, pl. 22, fig. 9; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 31, pl. 3, fig. 16; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 192.

Pseudoliva tuberculifera Cossmann, 1893, p. 33, pl. 11, fig. 13, young; *non P. tuberculifera* Conrad, 1860, Acad. Nat. Sci. Phila., Jour. 2d. ser., vol. IV, p. 294, pl. 47, fig. 27.

Subglobose, with revolving striæ, obscure, except the base, where they are distinct; spire short, rapidly narrowing to the apex, which is acute; tooth short and robust, placed at the termination of an exterior groove; basal emargination profound; labrum acute on the margin.—[Conrad, 1833].

Obovate, ventricose, thick, with obsolete spiral lines; summit of the body whorl indented; suture impressed; groove profound, between it and the base the shell is bicarinated and has a few impressed lines; umbilicus profound; tooth very short.

Syn. M. pyruloides, *Lea, Con. p.* 161, *pl.* 5, f. 166. M. fusiformis, *ib. p.* 162, *pl.* 5, *f.* 167.

Locality.—Claiborne, Alab.

The umbilicus varies much in size in different specimens and is generally wanting in old shells. No. 4, first ed. p. 44—[Conrad, 1835].

This is a species which is variable and extends through the

[499]Swainson, Wm., 1840, p. 82.

[500]Conrad, T. A., 1865, p. 21.

[501]Cossmann, M., Essais Pal. Comp., 4 liv., p. 19^c^

different stages of the Eocene. There are, however, some constant characters of the species in the different ages. Numerous names have been given to variations as well as to periods of individual development.

The nucleus consists of one whorl and a half, smooth and simple. The adult shell consists of three or four whorls. The young shells have conspicuous, spiral lines over the whole surface of the whorls, stronger between the shoulder of the whorls and the suture and below the spiral groove on the body whorl. In the adult the spiral lines are obsolete on the whorls of the spire if those whorls are not indented and below the basal revolving groove on the body whorl. In some cases the spiral lines may be seen obscurely on the body whorl. Often the first and second post-nuclear whorls have numerous and well-developed nodes predominating over the spiral lines. The amount of callosity of the inner lip varies with the specimens, on many it thickens posteriorly, envelopes the spire and distorts the shape of the shell. The margin of the outer lip between the groove and basal notch, is partially frilled.

The adult shell does not have the anterior end of the body whorl drawn out slightly so far as the young shells and the adults become more gibbous. Lea gave specific names which represent only different stages of growth . The species occurs in the Sabine Eocene in typical form. The umbilical area is covered. At the localities of Yellow Bluff, Bell's Landing, Ala. and Pendleton, Texas the anterior end of the body whorl is elongated much more than the specimens at Claiborne. At the localities mentioned the callus in the adult spreads over and covers the spire. At Hatchetigbee, Bashi Creek and Woods Bluff, Ala. the specimens are shorter in form but the whorls of the spire are distorted by the thickening of the callus in the posterior canal region.

Conrad, in 1865, listed six Eocene species of *Pseudoliva* (*Sulcobuccinum*) under *Buccinorbis* a new subgeneric name but he did not specify the type. Cossmann, 1901, unfortunately selected as type *P. vetusta*. *P. vetusta linosa* and *P. vetusta perspectiva* have the true umbilicus from young stages of growth, through the indivual growth stages to maturity. This character is a difference between typical *P. vetusta* in the Gosport sand at Claiborne which has rarely a small umbilicus and the umbilicated varieties at lower Claibornian and Jacksonian localities. Either of the two varieties of *P. vetusta, linosa* or *perspectiva* indicate more completely the characters of *Buccinorbis* which Conrad had in mind probably and what Cossmann meant. Cossmann figured *P. perspectiva* to illustrate the section.

Typical *vetusta,* as here restricted, occurs at Claiborne, Ala., Gosport sand and at lower Claibornian localities at Orangeburg, S. C. in Alabama and Texas. It occurs in the Sabine Eocene with slight variation. A few specimens have been found in the Jackson Eocene material. The common Jackon form is the variety *perspectiva.* Fragments of the species occur in the Midway Eocene.

Both Conrad and Lea figured specimens with the umbilical indentation but not with a "profound umbilicus" as seen in specimens other than those from the Gosport sand. The Conradian collection consists of specimens which vary as to the umbilical area, from that which is closed to a narrow umbilicus. However the majority of the 12 specimens have a small umbilicus. Since the specimen figured by Conrad was umbilicated, one of such must be selected as lectotype. Later collections from the "sand" of *P. vetusta* consist of non-umbilicated shells, even in young and the umbilicated specimens are rare. The species in the Sabine (Wilcox) is nonumbilicated.

Certainly the presence or absence of an umbilicus is not of generic value and possibly of no specific value. At least it must be used with reservations. Convenient varieties have been restricted under the names already given on the basis of the character of the true umbilicus. This species and its varieties deserve a special study.

P. vetusta belongs to the group *P. fissurata* Deshayes[502] (Thanetian) and *P. obtusa* Deshayes[502] (Suessonian and Parisian) of the Paris Basin Eocene. It resembles *P. obtusa* more closely than *P. fissurata.* The longitudinal striæ are stronger on both of the Paris Basin species than on *P. vetusta.* On *P. fissurata* they become strong on the spire and upper surface of the body whorl,

502 Deshayes, G. P., Des. Coq. Fos. Env. Paris, II, pp. 656, 657, pl. 87, figs. 21, 22 and pl. 88, figs. 1, 2, 1835; Cossmann M., and Pissarro, G., Icon. Comp., pl. 36, figs. 177-1, figs. 177-3, 1910-13.

and develop often into irregular, elongate nodes.

Dimensions.—Height, 21 mm.; greatest diameters, 18 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5836, A. N. S., *M. sulcatum* Lea lectotype.

Occurrence.—Midway. Sabine. Lower Claiborne: localiites 103, 707, 727, 734, 743, 745, 758, 766 and 843. Gosport sand: locality 104 (type).

Pseudoliva vetusta perspectiva Conrad in Gabb

Plate 42, figs. 1-6; Plate 85, fig. 4

Gastridium vetustum Conrad, 1854, Wailes Rept. of Ag. and Geol. Miss., pl. 17, fig. 4 [missprint, expl. pl. 16].

Pseudoliva perspectiva Conrad MS., in Gabb, 1860, Acad. Nat. Sci. Phila., Jour. vol. IV, 2d ser., p. 381, pl. 67, fig. 29.

Pseudoliva (*Buccinorbis*) *perspectiva* Conrad, 1865, p. 21.

Pseudoliva carinata Conrad, in Gabb, 1860, l. c., pl. 67, fig. 32; Conrad, 1865, p. 21 *Buccinorbis;* Conrad, 1866, p. 17.

Pseudoliva pyruloides var. *perspectiva* Meyer, 1885, Amer. Jour. Sci., vol. 29, No. 174, p. 468.

?*Pseudoliva vetusta* (Conrad) de Gregorio, 1890, p. 109 [partim], pl. 8, figs. 35-38.

Short, ovate, ventricose, spire very short, suture channelled; five revolving lines above the channel, below, seven or eight impressed revolving lines; columella callous; umbilicus large, polished within, and with a submarginal acute carina; umbilical margin carinated; labrum margin waved or dentate below the tooth at the termination of the canal.

"This is a very distinct species."—T. A. C.—[Conrad in Gabb, 1860].

The umbilical opening is large in the adult. It occurs in the young and throughout the stages of individual growth. This variety is characterized by a conspicuous carination within the umbilicus. The width of the carination from the margin of the umbilicus varies. The interior carination is present on young specimens as well as on adults. It has been found on over one hundred and thirty specimens from the Jackson Eocene. The specimens vary considerably in shape and in surface sculpture. The largest adults tend to be smooth over most of the surface of the shell. Large shells may be smooth or partly striated with revolving lines or they may have heavy revolving lines over all the surface.

There may be some doubt as to the uniting of *P. carinata* and *P. perspectiva.* The two at least have the carination within the umbilicus in common.

The holotype of *P. carinata* is a more slender shell than *perspectiva.* Gabb stated that his illustration of the type specimen is natural size, which is 36 mm., in height. The Meyer drawing of the type which Meyer stated is the best specimen in Conrad's collection is only 16 mm. Typical *carinata* in shape has been found in the collections from Moseley's Ferry, Texas, and Hammett's Branch, La. Conrad, in the description of the *perspectiva,* referred to the earlier illustration of a Jackson specimen. In 1865, he again referred the species to the Jackson Eocene. However, the lower Clabornian specimens of *perspectiva* characters are like the Jackson forms and show similar variation. *P. carinata* seems to be a more slender, elevated individual, a similar form of which is found in all the varieties of *P. vetusta* which may occur at any locality.

As is frequently the case with Conrad's illustrations, the figure given of *P. carinata* is probably a composition. Specimen No. 13268, labelled type of *P. carinata* at the Academy of Natural Sciences, is one of seven and broken. The Meyer drawing of the best specimen on the type card is included herein.

Dimensions.—Height, 31 mm.; greatest diameter, 25 mm., lectotype.

Lectotype.—No. 13271, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 723, 724, 726, 728, 729, 730, 731, 734, 741, 743, 745, 766 and 803. Jackson Eocene.

Pseudoliva vetusta, variety Plate 43, fig. 9; Plate 85, fig. 6

Monoceros fusiformis Conrad in Gabb, 1860, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 381, pl. 67, fig. 30; Conrad, 1865, p. 21; Conrad, 1866, p. 17 [misspelled *filiformis*]; non *M. fusiformis* Lea, 1833.

Fusiform, polished; umbilicus closed by the callus; spire conical, whorls four, slightly convex; suture profound; impressed line on the body whorl obsolete; aperture narrow, elliptical. Figure, natural size.—[Conrad in Gabb, 1860].

This form which like typical *vetusta* is most commonly non-umbilicated particularly in the young stages. This is found abundantly but mostly as young. Largest specimens found about 14 mm., height. It differs from the young of typical *vetusta* at Claiborne in being consistently more slender and smoother on the upper portion of the body whorl.

If this variant proves constant a new name must be applied since the original name is preoccupied.

Dimensions.—Height, 10 mm.; greatest diameter, 5.5 mm., lectotype.

Lectotype.—No. 13269, Academy of Natural Science, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 138, 723, 765 and 766; Wheelock, Texas (type).

Pseudoliva vetusta linosa Conrad in Gabb Plate 43, figs. 2, 3, 10

Pseudoliva linosa Conrad in Gabb, MS. in Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d ser., vol. IV, p. 381, pl. 67, fig. 31; Conrad, 1866, p. 17.

Pseudoliva (*Buccinorbis*) *linosa* Conrad, 1865, p. 21.

?*Pseudoliva vetusta moerens* de Gregorio, 1890, p. 109, pl. 8, fig. 39-40.

Subfusiform, spire high, whorls six; umbilicus open; suture profound; impressed line on the body whorl deep, rest of the whorl marked by numerous revolving ribs, first two or three whorls strongly undulate, aperture elliptical.

Dimensions.—Length 0.45 in., width of body whorl 0.3 in., length of mouth 0.3 in.—[Conrad, in Gabb, 1860].

The umbilical opening is wide in the adult shell. The margin of the umbilicus is carinated. The umbilicus occurs in the young specimens and occurs throughout the growth of the individual. This variety retains the spiral striations over the whole surface of the shell in older growth stages than does the typical form. The name *linosa* was given by Conrad and published by Gabb. It was applied to a Texan form. It is abundant at Smithville, Texas. The name *moerens* was applied by De Gregorio to an umbilicated form. He also figured an umbilicated specimen under *vetusta s. s.* His illustrations do not show definitely the umbilical region so as to distinguish the carinated umbilicus. If *moerens* has an inner carination in the umbilicus, the form would fall under *perspectiva.* In any case, it would not be retained as distinct.

The specimen labelled type, No. 13270, A. N. S., is a young shell, only 8 mm. in height. It is completely striated and the umbilical opening is small not excavated but indented compared to the large size of the adult.

However, the measurements given by Gabb are twice that of the specimen labelled type and the description gives the umbilicus as open. The author does not believe the specimen so labelled is the type shell.

This form differs from the varieties *perspectiva* or *carinata,* if those two are not the same, in not having a carinated line on the inner surface of the umbilicus.

Dimensions.—Height, 34 mm.; greatest diameter, 27 mm.

Holotype.—Not No. 13270 Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 733 and 767. Claibornian or lower Jacksonian: White Bluff, Ark.

Nomina nuda.

Pseudoliva vetusta var *pica* in Kennedy, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 103. The varietal name was used by Harris, in his Texas MS. report.

Pseudoliva vetusta var. *picta* in Kennedy, 1895, ibid, p. 122. The varietal name is a misspelling for *pica*.

Pseudoliva vetusta var. *clausa* in Kennedy, 1895, ibid, p. 103. Varietal name was used by Harris in his Texas MS. report.

Sagenella texana Conrad, 1865, p. 21 (non *Phos texanus* Gabb, 1860=*Buccitriton texanum*).

Doubtful species

Sulcobuccinum tuberculifera Conrad, in Gabb, 1860, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 294, pl. 47, fig. 27 is *Pseudoliva.* It is not from Claiborne, Ala. but from the Sabine Eocene. See Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 32, 1899.

Buccinum perlatum Conrad, 1833, p. 45; Harris, was not figured by Conrad. It does not seem to have been discovered since Conrad's time.

Subulate, with prominent longitudinal lines; and obsolete spiral striæ; volutions about twelve, acutely subturrited.—[Conrad, 1833].

Buccinum (*Nassa*) *iterandum* de Gregorio, 1890, p. 105, pl. 8, fig. 16; Cossmann, 1893, p. 34 (*Cominella?*) is a *Buccitriton* with fine, cancellate sculpture.

Buccinum (*Nassa*) *lucrifactum* de Gregorio, 1890, p. 105, pl. 8, fig. 17 is a *Buccitriton* with extremely fine, spiral lines and moderate, longitudinal folds.

These species were indicated by De Gregorio as probably from Claiborne. The holotypes are in the De Gregorio home, Via Mola 132, Palermo, Sicily.

Family NEPTUNEIDÆ

Genus SIPHONALIA A. Adams, 1863.[503]

Genotype by subsequent designation, Cossmann, 1889[504]. *Buccinum cassidariæformis* Reeve. Living. Japan.

[503]Adams, A., Ann. Mag. Nat. Hist. ser. III, vol. XI, p. 202, 1863; Iredale, T., Proc. Mal. Soc. Lond., vol. X, p. 223, 1912

[504]Cossmann, M., Ann. Soc. Roy. Mal. Belgique, tome 24, IV, ser. t. IV, p. 149, 1889.

"Siphonalia" perlata (Conrad) Plate 86, fig. 4

Fusus perlatus Conrad, 1835, p. 54, pl. 18, fig. 5; H. C. Lea, 1848, p. 100.
Strepsidura perlata Conrad, 1865, p. 17; Conrad, 1866, p. 19; de Gregorio, 1890, p. 85, pl. 7, fig. 20; Clark, 1896, U. S. Geol. Sur., Bull. 141, p. 67.
Siphonalia perlata (Conrad) Cossmann, 1893, p. 34.

Short-fusiform, ventricose, with revolving raised lines and narrow longitudinal costæ; whorls angulated; beak short, reflected.
Locality.—Claiborne, Alab.—[Conrad, 1835].

This species is tentatively retained in *Siphonalia.* It is less like the type of the genus than it is like fossil species which Cossmann, 1901, placed in the genus.

The Meyer drawing of the holotype is included herein.

There are fine, spiral ribs which alternate in size over the whole surface of the shell. Eleven, longitudinal, nodose folds occur.

Dimensions.—Height, 27 mm.; greatest diameter, 17 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

"Siphonalia" newtonensis (Meyer and Aldrich) Plate 45, fig. 5

Fusus newtonensis Meyer and Aldrich, 1886, Jour. Cincinnati Soc. Nat. Hist., vol. IX, No. 2, 43, pl. II, fig. 11.

Short fusiform. Aperture and canal more than half the length of the shell. Whorls regularly rounded. More than three smooth embryonic whorls form the nucleus. They are followed by four adult whorls. These are covered by elevated, revolving lines, which alternate on the whorl body, and which are crossed by elevated lines of growth. The last three whorls besids are ornamented by prominent, obtuse, transverse folds, about ten on each whorl, sigmoidally bent on the body whorl. Aperture angular posteriorly. Outer lip sharp, striated some distance within. Callus spread over the columella. Canal recurved.
Newton.
Fusus subscalarinus Heilpr. has whorls which are flattened on their upper part, while those of *Fus. Newtonensis* are convex.—[Meyer and Aldrich, 1886].

Dimensions.—Height, 17 mm.; greatest diameter, 10 mm.

Holotype.—Lower Claiborne: Newton, Mississippi.

Dimensions.—Height, 17 mm.

Holotype.—No. 70, Alabama Museum of Natural History, University, Alabama.

Occurrence.—Gosport sand: Pugh's Branch of Satilpa Creek, Clark Co., Ala. (Aldrich).

"Siphonalia" quadrilineata Aldrich
Siphonalia quadrilineata Aldrich, 1921, Bull. Amer. Pal., vol. IX, No. 37, p. 15, pl. 2, figs. 4, 5.

"Siphonalia" plummeri, new species Plate 45, figs. 3, 4

Shell small; whorls rounded, three or four; nucleus consists of four or five whorls, first two smooth minute, last three large with conspicuous, longitudinal ribs; the sculpture of the post-nuclear whorls begins abruptly with a large, longitudinal fold and spiral ribs; the surface of the shell is covered with fine, spiral threads, with a finer, intervening line; there are thirteen, longitudinal folds on an imperfect adult shell; the holotype has nine, longitudinal folds but it is an immature shell; short anterior canal; labrum crenate within.

This species resembles the sculpture as figured for *Fusus newtonensis* Meyer and Aldrich[505] but that species has a nucleus of all smooth whorls, with the last enlarged.

The nucleus of this species is distinct and will readily identify the species. The form probably belongs elsewhere generically.

The nucleus of the holotype is inclinded to the axis of the shell appearing slightly deformed. It occurs similarly on another species while on two other specimens it is in line with the axis of the shell.

Named in honor of Dr. F. B. Plummer of the Bureau of Economic Geology, University of Texas, Austin, Texas.

Dimensions.—Height, 21 mm.; greatest diameter, 8 mm., (adult).

Holotype.—No. 3092, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 727 and 733.

Genus **VERCONELLA** Iredale, 1914.[506]

(*Penion* Fischer[507], 1884 non *Penium* Philippi, 1865).

Genotype by monotypy *Fusus dilatatus* Quog and Gaimard. Living. Southern and western Pacific.

Three Eocene species *Fusus bellus* Conrad, and variety, *F. crebissimus* Lea and *F. delabechii* Lea belong to the same genus. The generic characters consist of a nucleus with three or four smooth whorls, the first minute, the second, third and fourth with

[505]Meyer, O., and Aldrich, T. H., Cincinnati Soc. Nat. Hist., Jour. vol. IX, No. 2, p. 43, pl. II, fig. 11, 1886.

[506]Iredale, T., Proc. Mal. Soc. Lond., vol. 11, p. 175, 1914 substitute name for preoccupied *Penion* Fischer.

[507]Fischer, P., Man. de Conch. p. 625, 1884; Iredale, T., Proc. Mal. Soc. Lond., vol. X, pp. 223-224, 1912.

a pronounced carination. Beneath the carination a spiral thread becomes interposed. The aperture is ovate with the canal narrow, medium elongate and twisted. The callus extends from the parietal wall to the posterior margin of the canal. The labrum is crenate within. Inner lip is smooth. The Clairbornian species are small and differ specifically in the form of sculpture. All have longitudinal folds crossed by fine, spiral ribs.

Cossmann placed the species in his genus *Suessionia* genotype *S. exigua* (Deshayes) of the Paris Basin Eocene. The American species differ distinctly from *S. exigua* in the form of the shell and in the character of the nucleus. *S. exigua* has a much shorter canal, notch-like and the nucleus is bulbous, larger and not carinated.

The species are like *Verconella dilatata* (Quoy and Gaimard) in the character of shape and canal. The author has not been able to find the nature of the nucleus of *Verconella* and so does not feel as though the generic identity of the species was ascertained with certainty.

Verconella crebissima (Lea) Plate 45, figs. 10, 14; Plate 86, fig. 5

Fusus crebissimus Lea, 1833, Dec., p. 147, pl. 5, fig. 149; H. C. Lea, 1848, p. 100; Harris, 1895, p. 14.

Shell subfusiform, furnished with longitudinal folds cut by rather rough, very closely set transverse striæ; substance of the shell thick; spire rather elevated; whorls seven, convex; canal rather short; mouth subrotund; outer lip finely crenate, within dentate.

Length .5, Breadth .2 of an inch.

Observations.—This species is remarkable for its transverse striæ, which are very closely set over the whole body of the shell. In some specimens these striæ are somewhat rough, and present a slightly imbricate appearance. —[Lea, 1833].

The Meyer drawing of the holotype is included herein.

Dimensions.—Height, 11 mm.; greatest diameter, 6 mm., holotype.

Holotype.—No. 5759, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Verconella Delabechii (Lea) Plate 45, figs. 1, 2, 8, 9; Plate 85, fig. 10

Fusus Delabechii Lea. 1833, p. 148, pl. 5, fig. 15; H. C. Lea, 1848, p. 100; Harris, 1895, p. 15.

Sipho Delabechii (Lea) Conrad, 1865, p. 17.

Strepsidura lintea Conrad, 1865, pp. 17, 142, 191, 210, pl. 20, fig. 1; Conrad, 1866, p. 19; Harris, 1895, p. 26; de Gregorio 1890 p. 86 pl. 9, fig. 17.

Suessonia Delabechei (Lea) Cossmann, 1893, p. 35; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 176.

Siphonalia lintea (Conrad) Cossmann, 1893, p. 34.
Strepsidura lirata Conrad MS. labelled specimen A. N. S. Phila.; Conrad, 1866, p. 19; Harris, 1895, p. 15.

Shell subfusiform, furnished with rather sharp longitudinal folds cut by imbricate transverse striæ; substance of the shell thick; spire somewhat elevated, acute at apex; whorls seven, subangular; canal short, flexed; mouth subangular; outer lip crenate, within striate.

Length 13-20th Breadth .3 of an inch.

Observations.—This species in many of its characters resembles the two last described. It may be known, however, by its imbricate striæ and obtuse angle on the superior part of the whorl where the folds are somewhat pointed. A single perfect and mature specimen only has been observed by me.—[Lea, 1833].

Superficially *V. delabechii* would be taken for either *V. bella* or *V. crebissima*. *V. delabechii* differs in having a delicate imbricate sculpture. When examined with the lens, the fine overlapping of the longitudinal layers is conspicuous. At the shoulder the longitudinal folds project as puckers or frills as in the Muricidæ. On the particular specimen Conrad called *S. lintea* there is a varix-like rib. The amount of imbrication varies.

The *Siphonalia lintea* Conrad was poorly illustrated by him. Through the kindness of Miss Helen Winchester, of the Academy of Natural Sciences, Philadelphia, a picture of the holotype is included herein. The appearance of *lintea* is misleading because the canal has been broken. After examining the type one sees that *S. lintea* is a gerontic *delabechii* with a broken canal. Conrad had later noted the identity of *lintea* for there is a label "=Delabechii Lea" with the type.

There is another good specimen in the Conradian collection which is typical *V. delabechii* (Lea) with a perfect canal. This is labelled "*F.* (*Strepsidura*) *Delabechii* Lea=*Strepsidura lirata* Conrad MS. type".

Dimensions.—Height, 15 mm.; greatest diameter, 8 mm., holotype. Height, 19 mm.; greatest diameter, 11 mm., holotype *S. lintea* Conrad.

Holotype.—No. 5781, Academy of Natural Sciences, Philadelphia, Pa. Holotype *S. lintea* Con. A. N. S.

Occurrence.—Gosport sand: locality 104.

Verconella bella (Conrad) Plate 45, figs. 11, 12, 15; Plate 85, fig. 11

Fusus bellus Conrad, 1833, Nov., p. 43; Conrad 1834, App. in Morton, p. 6; Conrad, 1835, p. 56, pl. 18, fig. 11; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363 [partim]; de Gregorio, 1890, p. 91, pl. 7, figs. 3, 5, 10 [partim]; Harris 1895, p. 7.

Fusus magnocostatus Lea, 1833, Dec. p. 147, pl. 5, fig. 150; H. C. Lea, 1848, p. 100.
Sipho bella Conrad, 1865, p. 16, [partim].
Sipho magnocostata (Lea) Conrad,, 1865, p. 17.
Strepsidura bella Conrad, 1866, p. 19.
Suessonia bella (Conrad) Cossmann, 1893, p. 31; Cossmann, 1899, Soc. Roy. Mal. Belg. Ann. tome XXIV, p. 157; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 175.
Fusus bellus var. *magnocostatus* (Lea) de Gregorio, 1890, p. 91, pl. 7, figs. 8, 9; pl. 7, figs. 11-12, var. *tupus*.
Suessionia magnocostata (Lea) Cossmann, 1893, p. 34; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 176.

Fusiform, with spiral elevated striæ and longitudinal costæ; spine elevated, acute; beak short and reflected; labrum with the submargin thickened, and with short elevated lines; margin waved.—[Conrad, 1833].

Fusiform, with revolving prominent very regular striæ, and longitudinal rather narrow regular costæ; spire elevated, pointed; beak short, slightly reflected; submargin of the labrum thickened and with short elevated within; margin waved.

Locality.—Claiborne, Alab.

The regularity of the ribs and striæ give this shell a beautiful appearance which is heightened by the symmetry of its form.

No. 4, first ed. p. 43.—[Conrad, 1835].

This is the *Fusus magnocostatus* of Lea. The Conradian material of labelled "*Strepsidura bella*" is a mixture of *Fusus magnocostatus* Lea and *Fusus crebissimus* Lea. The type of *bella* is *magnocostatus* Lea.

The spiral ribs of *V. crebissima* (Lea) are finer and more in number than of *V. bella* (Conrad). There are from ten to fourteen spiral ribs with only fine, linear interspaces on *crebissima* and seven to ten longitudinal folds.

The nuclei of the two species are of the same type. The first, two nuclear whorls are smooth and the following whorls have a smooth surface with a sharp shoulder below the middle line of the whorl.

In both species a few specimens show a single or double microscopic plication on the inner lip at the end of the callus at the point where the canal twists to the left. This is of no specific value.

Dimensions.—Height, 20 mm.; greatest diameter, 9 mm., holotype. Height, 10.5 mm.; greatest diameter, 6 mm., holotype *Fusus magnocostatus* Lea.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5771, A. N. S. holotype *Fusus magnocostatus* Lea.

Occurrence.—Claibornian: locality 707. Gosport sand: locality 104 (type).

Verconella bella leai, new variety Plate 45, fig. 6, 7,, 16

The form is like *V. bella* in shape, nucleus, aperture, canal and character of the sculpture. It differs in the number of longitudinal folds. There are ten or eleven, longitudinal folds on this form. The larger number of folds gives the shell a different appearance from the typical shells of the species. There seems to be a consistency in the number of the longitudinal folds otherwise one would include the form under *bella.*

This species as well as *V. bella* is common at the Orangeburg, S. C. localities. There the shells have the primary ribs and the surface frequently eroded so that underlying, microscopic striations are revealed in the interspaces. This condition may obscure the true identity of the shell.

Dimensions.—Height, 13 mm.; greatest diameter, 6.5 mm.

Syntypes.—Nos. 3093, 3094 and 3095, Paleontological Research Institution.

Occurrence.—Claibornian: localities 136, 708 and 734. Gosport sand: locality 104 (type).

Doubtful species

"Strepsidura laqueata" Conrad, 1865, p. 210, pl. 21, fig. 1; Harris, 1895, p. 23 from Claiborne, Ala. was figured by Conrad but never described. Nothing further is known concerning the specimen. It appears to belong near *Verconella.*

Genus **CANTHARUS** (Bolten) Roeding, 1798.[508]

Genotype by subsequent designation Cossmann,[509] 1889, *Buccinum tranquebaricum* Gmelin (=*C. globularis* Bolten). Living. Tranquebar.

Cantharus casteri, new species Plate 45, figs. 13, 17

Shell medium, elongate; nucleus broken; whorls five; aperture elongate; anterior canal medium in length; notch at the posterior end of aperture; umbilical indentation small; surface coarsely ornamented with large, primary, spiral ribs and alter-

[508]Bolten, J. F., Roeding, P. F., 1798, p. 132.
[509]Cossmann, M., Ann. Soc. Roy. Mal. Belgique, tome 24, p. 137, 1889.

nating, fine, revolving ribs crossed by longitudinal ribs which at the intersection with the primaries form nodes; on the first, two whorls there are 3 nodose spiral ribs; on the third whorl, a small intervening, spiral rib occurs; on the penultimate and body whorl a secondary series of spiral ribs occur with a fine spiral thread between; labrum crenate within.

This species known only by the holotype is unique. No other species has been found in the Clairbornian so far which belongs in the same genus with this species. It differs from all other Claibornian species of related genera by its coarser sculpture. The canal is longer than typical *Cantharus*.

The species is named in honor of Dr. K. E. Caster, of the Geology Department, University of Cincinnati, Ohio.

Dimensions.—Height, 22 mm.; greatest diameter, 12 mm.

Holotype.—No. 3100, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 733.

Genus **SYCOSTOMA** Cox, 1931.[510]

(*Sycum* Bayle, 1880 nec Agassiz, 1846; *Leiostomus* Swainson, 1840, nec Lacépède, 1802, fish.)

Genotype by original designation, *Fusus bulbiformis* Lamarck= *S. pyrus* (Solander) var. Eocene. France. England.

Sycostoma enterogramma (Gabb) Plate 46, figs. 2, 5, 8

Neptunea enterogramma Gabb, 1869, Acad. Nat. Sci. Phila., 2d ser. Jour., vol. IV, p. 378, pl. 67, fig. 14; Aldrich, 1886, Geol. Sur. Ala., Bull. 1, p. 24, pl. 3, fig. 5; de Gregorio, 1890, p. 83. *Fusus*.

Natica (*Euspira*) *enterogramma* de Gregorio, 1890, p. 153, pl. 15, fig. 8; Dall, 1892, p. 376 questions de Gregorio's generic determination.

Clavella ? enterogramma Heilprin, 1891, p. 395; Cossmann, 1901, Essais Pal Comp., 4 liv., p. 20.

Clavilithes enterogramma Cossmann, 1893, p. 36.

Fusiform, smooth; whorls six, those of the spire rounded or obscurely angulated above the middle; suture deep; outer lip striate internally.

Dimensions.—Length .9 in., width of body whorl .5 in., length of aperture .6 in.

Locality.—Wheelock, Texas. Smithsonian collection.

The striæ on the inner side of the outer lip of the only specimen I have seen consist of four prominent lines above the middle, and a few obsolete ones below. There are traces of a few impressed lines on the beak.—[Gabb, 1860].

Nucleus consists of one and a half or two whorls, smooth and rounded. The first whorl is obscure and worn and the best preserved specimens have a broken minute tip. On young shells

[510]Cox, L. R., Proc. Mal. Soc. Lond., vol. XIX, pt. VI, p. 291, 1931 new name for *Sycum* which was preoccupied by *Sycum* Agassiz, 1846,

11 mm. in height, the canal is long, slender and twisted. Such a condition is similar to that which occurs in *Mazzalina*. The canal in this species soon straightens and has a shorter appearance in proportion to the rest of the shell. The spire is high in the young, the suture is only slightly grooved, spiral lines occur along the base of the body whorl and the inner surface of the body whorl may or may not have spiral lines or crenations.

As the shells increase in age the suture becomes more grooved until in the mature specimens there is a conspicuous trough developed .

This species has long been classified as *Neptunea*. When the large suite of specimens, particularly the young, are compared with the type, *Fusus antiquus* Linnæus of *Neptunea* (Bolten) Roeding, there seems to be a relationship. However *enterogramma* is more like the fossil forms of *Sycostoma* (*Sycum*). *Neptuna* lacks the crenulations of the outer lip. Such a character may not be of great importance generically. The young individuals of *enterogramma* are typical of *Sycostoma*. Dr. Beatrice Bolten Hughes[511] figured one specimen of *S. pyrus* showing a heterostrophic nucleus. There is a suggestion of such a condition in *enterogramma* but no absolute evidence.

Gabb's species differs from the other species of *Sycostoma* in the development of the grooved suture.

Sycostoma is apparently close to *Mazzalina* and their precise relationship will remain probably a question of personal opinion. The two genera seem to have a close origin, with *Sycostoma* diverging in canal development. They both have similar slender, twisted canals in the small specimens. *Mazzalina* retains this character in the adult while *Sycostoma* develops a shorter, straighter canal. *Mazzalina* also has the development of nodes on the whorls and irregular plications on the columella. Extreme specimens in old age in *enterogramma* show obscure, longitudinal lines.

Dimensions.—Height, 99 mm.; greatest diameter, 47 mm.

Holotype.—Not found.

Occurrence.—Lower Claiborne: Wheelock, Texas (Gabb). Localities 723, 733, 734, 765, 766 and 778.

[511] [Hughes] Bolten, Beatrice, 1931, pl. 39, figs. 1a, b.

Sycostoma americanæ, new species Plate 46, figs. 7, 9

Shells large; spire low; apex sharp; body whorl greatly enlarged; surface smooth, the growth lines swing vertically to the posterior line of the canal and then turn sharply at about a right angle and extend horizontally to the columella; large callus over the inner lip; columella and inner lip smooth; canal long and nearly straight. The anterior tip broken as well as the outer rim of the labrum. The apical whorls are broken.

The type material is limited to a large adult. As the young and adults differ in shape in this and allied genera, the finding of immature material to complete the life history of this species is anticipated with keen interest. The species is a typical *Sycostoma* as represented in the Paris Basin and English Eocene.

This species differs from *S. enterogramma* in having a shorter spire, more enlarged body whorl and the suture appressed. It lacks the pronounced, sutural groove of Gabb's species. Both species attain a large size. So far as specimens found indicate, *S. americanæ* is the larger form. It rivals in size the English *pyrus*.

S. americanæ is close to the shape of *S. bulbiforme* (Lamarck) which in the adult has the shortened spire. The long, nearly straight canal with the growth lines swinging at right angles to the canal is strikingly alike on the species.

The species of *Sycostoma* in the English and Paris Basins, undergo a great deal of variation and *S. bulbiforme* (Lam.) of the Paris Basin is only a variety of the first named form by Solander[512], *pyrus* (plate 46, figs. 1, 6) from England and equivalent to Solander's *bulbus*.

From knowing the shell development thoroughly of the English and Parisian species one may surmise generally what the young of *S. americanæ* would be.

Sycostoma is represented in the Eocene horizons of California. According to Cossmann[513] the genus ranges from the Paleocene through the Oligocene.

[512]Solander, D. C., in Brander, 1766, p. 26, as *Murex pyrus* and p. 27 as *Murex bulbus*.

[513]Cossmann, M., Essais Pal. Comp., IV liv., p. 81, 1901.

Dimensions.—Height, 111 mm.; greatest diameter, 69 mm. (canal broken).

Occurrence.—Lower Claiborne: locality 734.

Genus **LEVIFUSUS** Conrad, 1865.[514]

Genotype by subsequent designation, Cossmann, 1901[515], *Fusus trabeatus* Conrad. Eocene. United States.

Levifusus is placed in the Fusidæ by Cossmann[516] and Grabau[517]. It was regarded by Dall[518] and Harris[519] as related to *Busycon* (*Fulgur*). Maury[520] found the form *Levifusus fulguriparens* which shows such a relationship.

Levifusus trabeatus (Conrad) Plate 51, figs. 3, 6, 12; Plate 85, fig. 2

Fusus trabeatus Conrad, 1833, Sept., p. 29; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 53, pl. 18, fig. 1; H. C. Lea, 1848, p. 100; Harris, 1895, p. 46.
Fusus bicarinatus Lea, 1833, p. 146, pl. 5, fig. 147 young; H. C. Lea, 1848, p. 100.
Fulgur trabeatum Conrad, 1853, Acad. Nat. Sci. Phila., Proc. vol. VI, p. 317.
Levifusus trabeatus Conrad, 1865, p. 17; Conrad, 1866, p. 19.
Fusus (*Lirofusus*) *thoracius* mut. *bicarinatus* de Gregorio, 1890, p. 87, pl. 6, fig. 30.
Fusus (*Levifusus*) *trabeatus* (Conrad) de Gregorio, 1890, p. 86, pl. 6, fig. 39; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 14.
Semifusus trabeatus (Conrad) Cossmann. 1893, p. 34.
Levifusus trabeatus (Conrad) Harris, 1896, Acad. Nat. Sci. Phila., Proc. vol. 48, p. 479, pl. 22, fig. 11; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 50, pl. 6, fig. 8; Grabau, 1904. Smith. Misc. Coll., vol. 44,, No. 1417, pl. 17, fig. 7; Aldrich, 1911, Bull. Amer. Pal., vol. V, No. 22, p. 10, pl. V, fig. 3 var.

Shell subfusiform, ventricose, with revolving elevated striæ at the base, and more obscure ones on the spire; body whorl with two distinct rows of tubercles, humeral one continued on the spire. Length 1½ inches.
Locality.—Claiborne, Alab.
Cab. Acad. N. C.—[Conrad, 1833].

Subfusiform, thin ventricose, with elevated revolving striæ at the base and more obscure ones above; body whorl with two distinct rows of compressed tubercles; humeral one continued on the spire; whorls angular; beak produced, flexuous; aperture patulous.
Syn. F. bicarinatus, *Lea, Contrib. p.* 146, *pl.* 5, *f.* 147.
Locality. Claiborne, Alab.
No. 3, first ed., p. 29.—[Conrad, 1835].

The nucleus consists of two or three smooth, globose whorls,

514 Conrad, T. A., 1865, p. 17.
515 Cossmann, M., Essais Pal. Comp., 4 liv., p. 14, 1901.
516 Cossmann, M., ibid, p. 14, 1901.
517 Grabau, A. W., 1904, pp. 2, 80.
518 Dall, W. H., 1890, pp. 109, 117.
519 Harris, G. D., Acad. Nat. Sci. Phila., Proc. vol. 47, p. 70, 1895.
520 Maury, C. J., Amer. Jour. Sci., vol. 27, p. 335, 1909.

the fourth whorl is smooth followed by small area of longitudinal ribs only with the remainder of the whorl carrying both longitudinal and spiral ribs. The columella has a definite twist as in *Latirus*.

The Sabine (Wilcox) forms of this species do not have the nodes of the carinæ so well developed as in the Claiborne specimens and the spiral lines are more strongly developed on the Wilcox forms.

The crenulations on the inside of the outer lip are well developed and extend down to the beginning of the canal. They are stronger on the known robust specimens of the Sabine than on the thinner Claiborne forms.

The Midway[521] specimens of the species have differences in characters great enough for distinct varietal rank. There are fewer nodes on the carinæ of the whorls. The upper carina of the body whorl occurs lower on the whorl on the Midway variety and the canal is not so long as typical.

Dimensions.—Height, 57 mm.; greatest diameter, 32 mm.. Height, 7.5 mm.; greatest diameter, 5 mm. *F. bicarinatus* Lea, holotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5756, A. N. S. *Fusus bicarinatus* Lea, holotype.

Occurrence.—Sabine Eocene. Gosport sand: Claiborne, Ala. (type).

Levifusus trabeatoides Harris Plate 51, figs. 1, 2, 4, 5, 7-8, 11

Fusus trabeatus Heilprin, 1891, p. 395 non Conrad, 1833.
Levifusus trabeatoides Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 69, pl. 6, fig. 12, a.

General form as figured; whorls 8 or 9; 1, 2, 3, smooth and polished, 4 sub-biangulated, 5, 6 with one spiral line just below the suture and two or three more near the base of each whorl where they are crossed by sharp fine, costæ, 7 evenly striate spirally showing more or less distinct costæ and curving lines of growth; body whorl evenly striate, bicarinate, with faint indications of tubercles on each carina, lines of growth with a retral curve above the upper carina resembling those of *Surcula;* labrum strongly striate within.

Below the two prominent carinæ there is a third faint one. Large old specimens sometimes show on the body whorl one very strong carina above, while the two lower are rudimentary. Fragments have been obtained which would indicate a total length of an entire specimen of at least three inches.

The generic name *Levifusus*, as far as the writer is aware, has never been characterized; yet since Conrad has referred to it the species formerly

[521]Aldrich, T. H., Bull. Amer. Pal., vol. I, No. 2, p. 10, pl. 4, fig. 6, 1895; Harris, G. D., Bull. Amer. Pal., vol. 1, No. 4, p. 95, pl. 9, fig. 10, 1896.

described as *Fusus trabeatus* and *Busycon? blakei*, its characters must be fairly familiar to every worker in Tertiary paleontology. They may be summed up as follows:—

Shell of Fulgurate aspect and affinities (not Fusoid as the name unfortunately indicates); with three carinæ on the body whorl, the uppermost strongest and generally spinose, the second less distinct and less frequently spinose, the third or lowest generally faint and obtuse and with no signs of tubercles or spines.

Besides the two species referred to this genus by Conrad, the writer has added two more, viz., *Levifusus branneri*, originally described from the White Bluff horizon of Arkansas, and *L. trabeatoides*.

At Woods Bluff, Ala., there is a form of *Levifusus* with characters intermediate between *L. trabeatus* and it is doubtless the ancestral type of both. This prototype may then be regarded as having produced the true *L. trabeatus* in Alabama, while in Texas the *L. trabeatoïdes* was developed. *L. blakei* is somewhat more tuberculate on its uppermost carina than *L. trabeatus* or *L. trabeatoides* but is not so strongly marked as *L. branneri;* the last mentioned species the writer has recently found in typical Jackson Eocene deposits at Moody's Branch, Jackson, Miss.

Localities.—Rio Grande, 2 miles above San José, Tex.; Mosley's Ferry, Brazos River; Colorado River, bluff just below the mouth of Alum Creek; Rio Grande, 15 miles below Carrizo; Little Brazos River, near iron bridge on Mosley's Ferry road; Brazos River, 500 yards below the mouth of Little Brazos; Cedar Creek, southeast corner of Wheelock League, Robertson Co.; Smithville, Bastrop Co.; Alum Bluff, Trinity River, Houston Co.; Campbell Creek, Robertson Co.; 2 miles west of Crockett, Houston Co.; northwest corner of Madison Co.; Jones' farm, Hurricane Bayou, Houston Co.; Orrell's crossing, Elm Crook, Lee Co.; cutting on Houston, East & West Texas R. R., 4 miles north of Corrigan, Polk Co.; southeast corner of Frio Co.; southeast of Campbellton, south of Lipan Creek, Attascosa Co. Also at Gibbsland, Bienville Park, La., and Walnut Bluff, Ouachita River, Ark.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The nucleus consists of three, smooth whorls, typical *Levifusus* in shape. The body whorl lacks the carinate shoulder of *L. trabeatus.* There is an intimation of such and a second lower carination also but it lacks the nodose character on either carination. The spiral lines predominate in sculpture. The crenulation of the inner surface of the outer lip is well developed and extends to the beginning of the canal.

A large collection of immature specimens shows some with carinæ simple; others with a finely nodose, superior carina, and others with both carinæ nodose.

Dimensions.—Height, 36 mm.; greatest diameter, 20 mm.

Holotype.—No. 705, Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 723 (abundant), 725, 727, 733, 741 and 766.

Levifusus mortonii (Lea) Plate 49, figs. 1-3

Fusus Mortonii Lea, 1833, p. 145, pl. 5, fig. 145; H. C. Lea, 1848, p. 100; Conrad, 1865, p. 16; Harris, 1895, p. 29; de Gregorio, 1890, p. 83, pl. 6, figs. 42-44; Cossmann, 1893, Ann. de Geol. et Pal., 12 liv., p. 37.
Neptunea Mortoni (Lea) Conrad, 1866, p. 19.
Levifusus ? mortoni (Lea) Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, pl. 18, fig. 3.

Shell subfusiform, furnished with large longitudinal folds, cut by transverse striæ which are enlarged on the folds; substance of the shell rather thin; whorls six, inflated, flattened at the top, subspinous on the angle; canal long and straight; mouth subrotund; outer lip sharp, within slightly crenate.

Length .7, Breadth .3 of an inch.

Observations.—A very distinct species, and remarkable for its strong folds covered by transverse striæ, which are so much enlarged on the folds as to give it a tuberculated appearance. On the angle of the whorl the superior stria is so much enlarged as to make the angle subspinous in perfect specimens—above it is without striæ.—[Lea, 1833].

The nucleus consists of three or more whorls, the first two or three whorls smooth, the fourth with widely spaced longitudinal ribs. The fourth or fifth whorl depending on the number that constitutes the nucleus, has well-developed, widely spaced longitudinal ribs over half of the whorl. The last half of the whorl contains the initial spiral ribs which may begin with two or three ribs.

There are two strong, equally developed spiral ribs on the post-nuclear whorls giving the whorls a slight bicarinate appearance. Below the second, prominent, spiral ribs and the suture is a large, subordinate spiral rib, larger than the fine intervening, spiral ribs but not so large as the two primary ribs. On the body whorl a third rib develops making three spiral ribs of primary importance.

There are usually ten longitudinal folds.

On adult specimens the area from the spiral rib on the shoulder of the body whorl to the suture, is smooth. On young specimens and on the whorls of the spire of the adults that area is sculptured with fine revolving lines. There is a slight twist to the canal.

Through the kindness of Miss Helen Winchester of the Academy of Natural Sciences, Philadelphia, Pa., the illustration of the holotype of *F. mortoni* Lea is included herein. The type has four spiral ribs on the last two whorls of the spire. The two other specimens in the type collection have 2 large spiral ribs on the whorls of the spire with a fine third rib just above the suture. Figures of specimens with a similar number of ribs are included.

Dimensions.—Height, 18 mm.; greatest diameter, 9 mm., holotype.

Holotype.—No. 5749, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707 and 708. Gosport sand: locality 104 (type).

Levifusus mortoniopsis (Gabb) Plate 49, figs. 7, 8, 12; Plate 86, fig. 7

Fusus mortoniopsis Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d ser., vol. IV, p. 377, pl. 67, fig. 15; Conrad, 1865, p. 16; Heilprin, 1891, p. 395.
Fusus mortoni mortoniopsis (Gabb) Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 72, pl. 7, fig. 4.
?*Euthriofusus Mortoniopsis* (Gabb) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 29.

Scalariform; whorls eight, angular and prominent; spire nearly as long as the aperture; aperture elongated angular above, canal long, straight, narrow; surface marked by about seven or eight prominent longitudinal ribs, crossed on the shoulder of the whorl by three fine revolving lines, and on the rest of the whorl by six or seven larger lines, with occasional finer ones alternating; on the canal, the alternation of one or two fine lines with a larger one appears to be constant.

Dimensions.—Length 1.4 in., width of body whorl .65 in., length of aperture including canal .8.

Locality.—Wheelock and Caldwell Co., Texas. Collections of the Smithsonian Institution and the Academy and my collection.

This species resembles *F. Mortoni*, Lea, but differs in the alternation of finer lines with the larger ones and in being proportionally more slender.—[Gabb, 1860].

Nucleus consists of three, smooth, elevated whorls; a few curved, longitudinal ribs occur on the fourth whorl followed by the well-developed, spiral ribs and longitudinal folds on the post-nuclear whorls.

The nucleus is like that of *L. mortoni*. *L. mortoniopsis* has 7 to 8, longitudinal folds while *mortoni* has 10 or more. The longitudinal folds are more distinct in *L. mortoniopsis* and the shoulder area is convex while in *L. mortoni*, the shoulder area is concave. The spire of *mortoniopsis* is higher, and the species has 8 whorls to 5 whorls in *mortoni*. This species is robust with strong sculpture. Some specimens are shorter and plumper than others. The Meyer drawing of the holoytpe is included.

Dimensions.—Height, 36 mm.; greatest diameter, 16.5 mm., holotype.

Holotype.—No. 13281, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 723, 725, 727, 733, 734, 766 and 778.

Levifusus mortoniopsis carexus (Harris) Plate 49, figs. 11, 13, 14

Fusus mortoni var. *carexus* Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 72, pl. 7, fig. 5; Harris, 1896, ibid, vol. 48, p. 472, pl. 18, fig. 12.

Differs from *mortoniopsis* Gabb, which is doubtless a variety only of *mortoni* Lea, by having a strong carina, one additional spiral line on the shoulder and less strongly alternating on the canal. The shell is much broader in proportion to its height and has a lower spire.

Locality.—Between Orrell's and Evergreen Crossing, Elm Creek; Lee Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The nucleus consists of three, smooth, elevated, whorls. A few, longitudinal curved ribs occur on the fourth whorl. The nucleus is like that of *L. mortoni* and *L. mortoniopsis.* This species was regarded as a variety of *mortoni* but from a microscopic comparison of the three species there seems to be a greater similarity of the form with *mortoniopsis* than those of *L. mortoni.* The number varies from eight to ten in *L. carexus.* The number of longitudinal folds varies while the other characters remain the same. On the basis of the remaining characters, specimens of *L. carexus* with eight longitudinal folds may be differentiated from *L. mortoniopsis* which has a similar number of longitudinal ribs. The primary spiral ribs of the whorls of the spire vary from one strong carina to two or three of equal importance. In both *L. mortoniopsis* and *carexus* the area between the carina or first primary rib and the shoulder has fine revolving striæ.

L. carexus is a broader, shorter form than *L. mortoniopsis* The apical angle of *L. carexus* is about 40° that of *L. mortoniopsis* is 30-35°.

Dimensions.—Height, 33 mm.; greatest diameter, 20 mm.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 24, 724, 727, 728, 729, 730, 731, 734, 741, 743 and 803. Material from 728 and 731 is typical.

Levi'usus irrasus (Conrad) Plate 49, figs. 6, 9, 10; Plate 86, fig. 6

Fusus irrasus Conrad, 1834, Acad. Nat. Sci. Phila., Jour. 1st ser., vol. VII, p. 145; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 54, pl. 18, fig. 10; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363; Conrad, 1865, p. 16.

Neptunea irrasa Conrad, 1866, p. 19.

Fusus (*Neptunea*) *irrasus* (Conrad) de Gregorio, 1890, p. 82, pl. 6, fig. 16.

? *Fasciolaria errasa* Cossmann, 1893, p. 36.
Fasciolaria irrasa (Conrad) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 15 under *Levifusus*.

Shell short fusiform, ventricose; beak and spire nearly equal in length; with longitudinal costæ, ten on the body whorl, and numerous prominent spiral striæ; summit of the whorls flattened; broadly but not profoundly channelled near the suture; suture not impressed. Length, one inch.

Locality.—Claiborne, Alabama.

This shell is allied to *F. stamineus*, nobis, but may be distinguished by its more numerous spiral striæ, and by the channel on the summit of the whorls.—[Conrad, 1834].

Short-fusiform, ventricose, with longitudnial undulations on the body whorl and costæ on the spire; revolving striæ very prominent; summit of the whorl flattened, broadly but not profoundly channelled; suture not impressed; beak tapering, nearly straight.

F. irrasus, nob. Journ. Acad. Nat. Sciences, vol. 7, *p.* 145.

Locality, Claiborne, Alab.—[Conrad, 1835].

Each whorl of the spire has three prominent revolving ribs with intervening threads. The heavy, spiral ribs occur on the body whorl but continue over the basal portion of the whorl as well. Above the heavy spiral rib and the suture are finer spiral lines. The spiral sculpture is crossed by large longitudinal folds which give the spiral costæ a nodose and sharp appearance. The spire is sharply pointed. The canal may be straight or curved. The inner surface of the outer lip is crenulated. The author has not found on any of the numerous specimens of this species columellar plications as noticed on specimen which Cossmann possessed and which caused him to place the species under *Fasciolaria*. It may be Cossmann had specimens as in many cases of the *Levifusus* forms, where the heavy, spiral ribs of the base show through a thin colummellar callus.

Superficially this species might be confused with *L. mortoniopsis carexus* Harris from the lower Claiborne. The two forms have the general shape and the sharp, pinched character of the nodes, alike. The distinguishing character of *L. irrasus* from *carexus* as well as the other species of *Levifusus* is the channel of the whorls just below the suture on *L. irrasus*. Between the sharp edge of the channel and the carina or first primary, spiral rib of the whorl, on *L. irrasus* numerous equally developed, fine, spiral threads occur.

The Conrad type collection consists of 2 specimens. The Meyer drawing of the larger specimen is included. The other, a smaller one is probably the specimen Conrad figured.

Dimensions.—Height, 27 mm.; greatest diameter, 18 mm., Conrad specimen.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Levifusus irrasus hodsoni, new variety — Plate 49, figs. 4, 5

Nucleus consists of three, smooth, elevated whorls. There are a few curved, longitudinal ribs on the fourth whorl. The nucleus is like that of *L. mortoni, mortoniopsis* and *carexus.* There are nine, large, longitudinal folds. Only one specimen was found so that the possible variable in number may not be determined. The longitudinal folds are crossed by strong spiral ribs. There is a well-marked channel below the suture which is bounded by a sharp and raised, spiral rib. The channel is as in *L. irrasus* and because of its presence the species is allied with *irrasus.* Four or five large spiral ribs occur from about the mid-line of the whorl and below. Between the first primary rib and the edge of the channel are two finer spiral ribs. On the midregion of the body whorl the interspaces are smooth. On the basal portion of the body whorl there is an intervening smaller spiral rib.

This form differs from *L. irrasus* in having stronger, spiral ribs with smoother interspaces. *L. irrasus* has two or three primary spirals on the whorls of the spire with fine, intervening lines. *L. hodsoni* has four or five primary ribs on the whorls of the spire. The interspaces of the ribs on the mid-portion of the body whorl in *irrasus* have fine spiral striæ. On *hodsoni* the interspaces are smooth.

As yet this species has been found only at Smithville, Texas, in the Weches formation, lower Claiborne.

This variety is named in honor of Dr. Floyd Hodson.

Dimensions.—Height, 27 mm.; greatest diameter, 13 mm.

Holotype.—No. 3118, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 733 and 767.

Levifusus pagoda (Heilprin) — Plate 50, figs. 1, 4, 5, 6, 8

Pleurotoma pagoda Heilprin, 1880, U. S. Nat. Mus., Proc. vol. III, p. 149, pl. 1, fig. 1 inserted in Smith. Misc. Coll., vol. 22, p. 149, pl. 1, fig. 1.

Fusus pagodiformis Heilprin, 1880, Acad. Nat. Sci. Phila., Proc. vol. 32, p. 375; de Gregorio, 1890, p. 92; non *Fusus pagodus* Lesson, 1831.

Fusus pagodæformis Heilprin, 1891, p. 395.

Levifusus pagoda var. Harris, 1896, Bull. Amer. Pal., vol. I, No. 4, p. 93, pl. 9, fig. 8 [Midway form].

Levifusus pagoda (Heilprin) Aldrich, 1897, Bull. Amer. Pal., vol. II, No.

8, p. 4, pl. 3, fig. 3 [figure of holotype]; Harris, 1899, ibid, vol. III, No. 11, p. 51, pl. 6, fig. 10; Aldrich, 1931, Geol. Sur. Ala., Museum Paper No. 12, p. 6, pl. 5, figs. 1-3, 6, 7.

Fusus (*Levifusus*) *pagodiformis* (Heilprin) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 14, pl. 1, fig. 16-17.

Ventricose; whorls about nine, the body-whorl nodulated on its most convex portion (nearly central), the nodulation consisting of a single series of sharp, obtusely-pointed, and flattened spines or nodes, which frequently appear double by the crossing of an impressed line over their basal portion; upper volutions with a similar series of nodes almost immediately above the sutural line, and gradually dwindling off into a crenulation; upper surface of the whorls concave, faintly striated, the sinual rugæ indicating but a faint sinus; lower surface with numerous well-developed revolving lines, which show a tendency to alternate. Aperture exceeding the spire in length, considerably contracted at about its center.

Length, 1½ inch (No. 1505).

Eocene of Alabama.

This species in its general appearance greatly resembles certain forms of *Fusus*, and a comparison of more numerous specimens may show it to belong to that genus, although the ornamentation of the whorls, as well as the sinual indication, more clearly point to *Pleurotoma*. The only two specimens in the collection have the outer lip fractured, and I am therefore unable to pronounce conclusively upon the presence of a true notch.—[Heilprin, 1880].

Aldrich[522] was probably right when he suggested that Heilprin's type specimen came from the Sabine (Wilcox) Eocene. The species occurs in typical form in the lower Claiborne at several localities. However the specimens from Sabine localities show the growth lines above the nodes predominating over the spiral lines as in the figure of Heilprin. On lower Claiborne forms, the spiral lines are slightly more evident on the superior portion of the shell.

All the specimens examined have the outer lip fractured back of the region where crenulations would occur so that one cannot determine to what extent the inner surface would be crenulated.

When Heilprin placed the species in *Fusus* he changed the specific name because there was a *Fusus pagoda* of Lesson. *Levifusus* is generically distinct from *Fusus* (*Fusinus*), and Heilprin's original specific name should be used because the original name, *Pleurotoma pagoda,* is not preoccupied by the *Fusus pagoda* of Lesson.

As Prof. Harris pointed out in 1899, there are a large number of the Sabine specimens which have the carina raised above the suture with intervening spiral threads below the carina. This relation of the suture and carina is the more common form and probably represents the specific development but the name was

[522] Aldrich, T. H., Bull. Amer. Pal., vol. II, No. 8, p. 4, 1897.

first given to the form of shell with the carina just above the suture. The difference as discussed occurs between shells in the lower Claiborne stage as well, so that it seems to be constant enough to designate by name. It is herein described as *prepagoda*, n. var.

The nucleus of *L. pagoda* consists of three smooth, elevated whorls. A few curved longitudinal folds occur on the fourth whorl.

Dimensions.—Height, 46 mm.; greatest diameter, 23 mm.

Holotype.—? No. 1505. United States National Museum, Washington, D. C.

Occurrence.—Sabine Eocene (type). Lower Claiborne: localities 728, 730 and 731.

Levifusus pagoda prepagoda, new variety Plate 50, figs. 2, 3, 7, 9

The size and general shape are as in *L. pagoda.* On *L. pagoda* s. s. the row of nodes on the whorls of the spire occurs just above the suture. In *prepagoda* the row of nodes occurs just below the mid-line of the whorl which allows a wide area between the row of nodes and the suture. Spiral lines occur in the area below the nodes. The lower spiral lines are stronger than those above the nodes.

The sculpture as described has been found in growth stages of young and adult. This variety is more common than *L. pagoda.*

Dimensions.—Height, 49 mm.; greatest diameter, 20 mm., holotype.

Holotype.—No. 3126; paratypes Nos. 3123 and 3124, Paleontological Research Institution.

Occurrence.—Sabine: Woods Bluff (type) and Gregg's Landing, Ala. Lower Claiborne: localities 725, 727, 733, 741, 768 and 803.

Levifusus? harrisi Grabau Plate 48, fig. 3

Levifusus? harrisi Grabau, 1903, The Amer. Nat., vol. 37, No. 440, p. 526; Grabau, 1904, Smith. Misc. Coll., vol. 44, p. 86, pl. XVII, fig. 5.

On searching for the Eocene ancestor of the fulgurs we apparently find it in a type from the lower Claiborne of Texas, which has been identified with *Levifusus pagoda* Heilprin. This type, however, differs from Heilprin's species in having a true Fulgur protoconch, whereas *L. pagoda* has a three-whorled naticoid protoconch with gradually enlarging volutions ornamented in the latter portion by semilunar riblets. This type of protoconch is characteristic of many species of Pleurotoma, to which Levifusus seems to be closely related. But in the Texan type the obliquely elevated, swollen fulguroid protoconch is smooth for a little over a whorl and then is furnished with fine vertical ribs which merge into those of the round-whorled succeeding portion of the shell. There are at least two round whorls with simple ribs and simple spirals, after which the shoulder flattens out and the ribs become faint toward the suture. An angulation appears on the whorl, formed at first by two strong spirals, but later the upper becomes strongest and causes the formation of rather flattened blunt serrations. Intercalated spirals appear on the sixth whorl.

This shell, though much smaller than the Fulgurs, has all the characteristics required for an immediate ancestor. It must, of course, be separated from *Levifusus pagoda*, Heilprin, and I propose to designate it *Levifusus? harrisi*, after Professor Gilbert D. Harris, whose indefatigable labors in the Tertiaries of the Gulf region have brought together a wealth of material which may serve as a basis for further phylogenetic study. Both Dall and Harris consider Levifusus in the line of ancestry of Fulgur; the latter, indeed, regards *L. pagoda* Heilprin as the prototype of the Fulgurs. The protoconch of the ordinary form of *L. pagoda* does not satisfy the conditions of such an ancestor, but that of the Texan form does. Whether or not these two types are to be considered congeneric remains to be determined; further investigation may show that the changes from a normal naticoid type of protoconch to the oblique swollen Fulgur type occurred in this genus. We may well believe that at first the form remained unstable, oscillating between the two types, but by the time Fulgur had developed, that feature no doubt, had become stable. At the same time fulguroid types were probably developed from the normal *Levifusus pagoda*, the result being such types as "*Fulgur*" *spiniger* Conrad, which, as already noted, is not a true Fulgur. Spiniger-like forms also developed among the true Fulgurs, the similarity of forms in both cases being explainable as an instance of parallelism. "*Fusus*" *quercollis* Harris from the Midway stage, and "*Fusus*" *rugatus* Aldrich from the Lignitic, seem to be related to the ancestors of Fulgur. These types, for which the generic name Fulgurofusus is proposed have a fulguroid protoconch, while the early whorls are almost identical with those of Fulgur. The adult *F. quercollis* has the Fulgur characters of whorls grafted upon a Fusus form. This type is more accelerated in that its whorls become angular as early as do those of Fulgur, and it is not impossible that this type may be in direct line of ancestry of Fulgur. In that case *Levifusus? harrisi* cannot be considered as in direct line of ancestry.—[Grabau, 1903].

Holotype.—Not found.

Nomen Nudum

Neptunea submortonii (Gabb) Conrad, 1866, p. 19; de Gregorio, 1890, p. 83 is a nomen nudum.

Family **FASCIOLARIIDÆ**

Genus **FASCIOLARIA** Lamarck, 1799.[523]

Genotype by monotypy *Murex tulipa* Linné. Living. Southeastern United States and the West Indies.

? Fasciolaria samsoni Whitfield — Plate 47, fig. 9

Fasciolaria samsoni Whitfield, 1892, U. S. Geol. Sur., Mon. XVIII, p. 204, pl. 27, fig. 4; pl. 28, figs. 1, 2.

[523]Lamarck, J. P., 1799, p. 73.

The Harris collections contain from the lower Claibornian, at the base of Claiborne Bluff, near the upper Landing, the broken specimen of a large *Fasciolaria*-like shell. The body whorl and penultimate whorl are intact except for the marginal portion of the labrum. Replaced shell is preserved over half of the body whorl, the remaining part of the specimen is in the form of an internal mold. The surface of the shell is smooth with no indication of nodes. The surface is narrowly shouldered at the suture. The parietal callus is apparently thin, glazelike. The surface of the columella is destroyed too much and embedded in matrix to determine plications. As nearly as can be detected there are apparently no large plications in the anterior parietal region as is characteristic of *Xancus*. Whether there are plications at the twist of the columella as in *Fasciolaria* cannot be determined from the specimen. Only the upper portion of the canal is preserved. It is more suggestive of *Fasciolaria* than *Xancus*. The Claiborne, Ala. specimen is strikingly like the large form from the Claibornian[524] Shark River marl of New Jersey, described by Whitfield as *Fasciolaria samsoni*. The Shark River and the Claiborne Bluff specimens are the same size.

Whitfield[525] described three other Fasciolarias from the Shark River marl, all three species being nodose.

Dimensions.—Greatest diameter, 95 mm.

Holotype.—No. 5542/1, American Museum of Natural History, New York, N. Y.

Occurrence.—Lower Claiborne: locality 103.

Genus **CORNULINA** Conrad, 1853.[526]

Cornulina Conrad, 1853, Acad. Nat. Sci. Phila., Proc., vol. VI, p. 321; Tryon, 1881, Man. Conch., vol. III, p. 102; Tryon, 1882, Struct. and Syst. Conch., vol. II, p. 135; Fischer, 1884, p. 621 under *Melongena;* Dall, 1890, p. 118; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 87.

Shell short-fusiform, spinous; columella rounded; labrum with three teeth, two of them very small.

This genus embraces three Eocene species, which differ from Monoceros in having a rounded columella and three teeth on the labrum.—[Conrad

[524]Harris, G. D., Science, N. S., vol. 43, pp. 532-33, 1916; Cooke, C. W. and Stephenson, L. W., Jour. Geol., vol. 36, No. 2 p. 146, 1928.

[525]Whitfield, R. P., U. S. Geol. Sur. Mon. XVIII, pp. 202, 204, pl. XXVI, figs. 9-11; pl. XXVII, figs. 1-3, 1892, *F. hercules* and *propinqua;* Whitfield, R. P., Amer. Mus. Nat. Hist., Bull. No. 21, p. 300, figs. 1, 2, 1905, *F. crookiana.*

[526]Conrad, T. A., Acad. Nat. Sci. Phila., Proc. vol. VI, p. 321, 1853.

1853].

Genotype by subsequent designation, Fischer, 1884[527], *C. armigera Conrad.* Eocene. United States.

The three species listed by Conrad under *Cornulina* were *Murex minax* Solander, *C. armigera* (Conrad) and *C. crassicornuta* (Conrad). *Murex minax* Solander was listed first but was not designated as type. Fischer, in 1884, designated *C. armigera* Conrad as type antedating Cossmann, 1901. Dall, in 1890, misstated when he said that *Murex minax* had been designated as type originally.

The American variant is related so closely to the English types of the species *C. minax* that the established characters of the genus would not be disturbed if either form was used as type.

Melongena (Cornulina) minax (Solander) Plate 41, fig. 11

Murex minax Solander, 1766, in Brander, Foss. Hantoniensia etc., p. 30, pl. 5, fig. 62; Sowerby, 1821, Min. Conch., vol. III, pl. 229, fig. 2.

Fusus minax, Lamarck, 1822, Hist. Nat. An. sans Vert., vol. VII, p. 135; Deshayes, 1824, Desc. Coq. Fos. Env. Paris, Tome II, p. 568, pl. 77, figs. 1, 2, 3, 4.

Cornulina armigera Aldrich, 1886, Geol. Sur. Ala., Bull., I, pp. 50, 53; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 64, pl. 8, figs. 8-11.

Murex (*minax*) testa ovata transversim striata, anfractibus spinosis: venture duplici serie, cauda truncata.

Murici Trunculo *Linn. Syst. nat. p.* 747. *n.* 447. valde affinis, forte sola varietas, differt præique duæ tantum series spinarum in primo anfractu, dum in *M. Trunculo* plures, neque *Suturæ* in nostra apparent, quæ in Murice Trunculo notabiles sunt, præsertim in cauda.—[Solander in Brander, 1766].

The species originated in the Sabine (Sparnacian) of either Europe or America and probably on the Pacific side of South America, continuing a development through the Eocene in both areas. In England it ranged into the Oligocene.

In America in the Claibornian the form changed and remained constant enough to be of stratigraphic value. The American Sabine variety resembles the typical, (pl. V, fig. 62, Solander) commoner highspired and coarsely, spirally striated form of the Bartonian of England and France than to the shorterspired with the shorter canal, *C. minax armigera* of the Claibornian. There are fewer nodes (i. e. in one row) on the Sabine form than on the Bartonian. Apparently in the Bartonian the species reverted to characters which were more dominant in the stock. The last of the species in North America is the little known variety *heilprin-*

[527]Fischer, P., Man. de Conch., p. 621, 1884; Newton, R. B., 1891, p. 311 for correct date.

iana from the Jackson of Texas. A. A. Olsson[528] pointed out the existence of this stock in Peru from lower middle (Salina) through the upper Eocene. The species *C. levifusoides* Olsson is similar to *C. minax* (Solander) of the Bartonian of France and England. *C. levifusoides* persisted in its long range with little variation thus indicating further that such a form represents the dominant characters of the stock.

Cossmann designated the Sparnacian form of France, *M. præcursor*[529] distinct from *minax*.

The species is known to have extended southward as far as Nigeria in the upper Lutetian[530].

Cornulina minax armigera (Conrad) Plate 41, figs. 12, 14, 15

?Melongena armigerus Conrad, 1833, p. 30; H. C. Lea, 1848, p. 101; Harris, 1895, p. 6.
Monoceros armigera Conrad, 1833, Nov., p. 44; Conrad, 1835, p. 37, pl. 15, fig. 1; d'Orbigny, 1850, p. 369.
Fusus Taitii Lea, 1833, p. 152, pl. 5, fig. 159.
Cornulina armigera Conrad, 1853, Acad. Nat. Sci. Phila., Proc. vol. VI, p. 321.
Cornuliria armigera Conrad, 1865, p. 21, [missprint].
Cornulina armigera Conrad, 1866, p. 17; Tryon, 1881, Man. Conch., vol. III, p. 102, pl. 29, fig. 56; Dall, 1890, p. 118; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 87, pl. IV, fig. 5.
Cornuliria armigera de Gregorio, 1890, p. 111, pl. 8, figs. 48-50, pl. 9, fig. 3; Cossmann, 1893, p. 35.
Cornulina armigera young var. Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 6, pl. 4, fig. 4.

Shell subglobose, ponderous; body whorl with a double row of short, thick spires, one on the shoulder, the other near the middle; three or four strongly impressed lines towards the base; columella and lip callous; basal emargination profound, spire subconical, convex, constituting nearly half of the shell, the humeral spires revolving upon it. Length 2½ inches. Breadth 2 inches.

Locality.—Claiborne. Alab.

Cab. Acad. N. S.—[Conrad, 1833, p. 30].

More perfect specimens prove the existence of a tooth on the labrum of this shell.—[Conrad, 1833, p. 44].

Short subfusiform, ventricose, ponderous, with two series of distant prominent thick spines, one on the shoulder, the other near the middle of the large whorl; base reflected, carinated; labrum with a short tooth and two inferior small teeth.

Syn. Fusus Taitii, *Lea. Con. p.* 152, *pl.* 5, *fig.* 159.

[528]Olsson, A. A., Bull. Amer. Pal., vol. XIV, No. 52, p. 84, pl. 17, fig. 1, 1928.

[529]Cossmann, M. and Pissarro, G., Icon. Comp. Coq. Fos. Eoc. Env. Paris, pl. 39, figs. 191-8, 1910-13.

[530]Newton, R. B., 1922, p. 34, pl. 2, figs. 6, 7.

Locality.—Claiborne, Alab.

Resembles *Murex minax*, Brander. The spines near the labrum in some specimens are an inch long. I referred it with a mark of doubt to *Melongena* in No. 3, first edition.—[Conrad, 1853].

As has been discussed under *M. minax,* the species while showing clearly its derivation from the stock in the Sabine Eocene, developed differences in the higher horizon which mark it slightly from the parent stock. The Claiborne form, typical Gosport, in the adult state differs from the adult *M. minax* in being broader, in having a shorter canal, in having a shorter spire and in having the revolving striæ obsolete or obscure. Two or three revolving striæ often show on the lower part of the body whorl. The number of spines vary on individuals of all the forms.

Lower Claiborne specimens vary from typical *armigera* in having a longer canal as the Paris Basin, *C. minax*. Specimens are figured in comparison.

Dimensions.—Height, 60 mm.; greatest diameter, 46 mm., holotype. Height, 50 mm.; greatest diameter, 39 mm., holotype *Fusus taitii* Lea.

Holotypes.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5802, A. N. S. *Fusus taitii* Lea.

Occurrence.—Lower Claiborne: localities 138, 725, 766 and 778.

Cornulina minax heilpriniana Harris in Aldrich Plate 41, fig. 13

—————— ———— Heilprin, 1880, U. S. Nat. Mus., Proc., vol. 3, fig. 7 in Smith. Misc. Coll., vol. 22, fig. 7 on plate facing p. 150, 1881.

Cornulina armigera young var. Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 6, pl. 4, fig. 4.

Cornulina armigera heilpriniana Harris MS. in Aldrich, 1897, l. c., p. 6, pl. 4, fig. 4.

The following description of the variety is quoted from Harris Texas manuscript which was never published. Aldrich published the name and refigured Heilprin's specimen but referred the form to "young var." He mentioned the MS. name *heilpriniana* of Harris, thus placing the name on record.

Size and general form as indicated by the figure; spiral whorls about five in number, ornamented by nodose ribs crossed by fine spiral striæ; body whorl large, shouldered above, sharply indented below by a band over which the lines of growth bend forward and produce a tooth on the edge of the labrum; canal slightly curving, ornamented with rather strong raised spiral lines.

The specimen herewith represented is the same as that figured by Heilprin, and belongs to the U. S. National Museum. Its locality is not given. Specimens in the Survey collection however, are identically ornamented and are of the same form. They came from Atascosa Co.—[Harris, MS.].

This variety of the Jackson Eocene of Texas probably represents the end of the *Cornulina minax* stock in American. The species is only included here to record the description of this vaguely known form.

Holotype.—United States National Museum, Washington, D. C., fide Aldrich, 1897.

Occurrence.—Jackson Eocene: Atascosa Co., Texas.

Genus **LATIRUS** Montfort, 1810.[531]

Genotype by original designation *Latirus aurantiacus* Montfort =*Murex gibbulus* Gmelin. Living. Australia.

Latirus plicatus (Lea) Plate 86, fig. 9; Plate 87, figs. 1, 2

Fasciolaria plicata Lea, 1833, Cont. Geol., p. 143, pl. 5, fig. 142: H. C. Lea, 1848, p. 99; Harris, 1895, p. 35.
Latirus (*Peristernia*) *plicatus* (Lea) Conrad, 1865, p. 23; Conrad, 1866, p. 16.
Turbinella fusoides H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, p. 98, pl. 1, fig. 14.
Fasciolaria (*Latirus*) *plicatus* (Lea) de Gregorio, 1890, p. 78, pl. 6, fig. 5.
Latirus plicatus (Lea) Cossmann, 1893, p. 35.
Ruscula plicata (Lea) Casey, 1904, Trans. Acad. Sci. St. Louis, vol. XIV, No. 5, p. 162.

Shell subfusiform, turrited, largely and longitudinally folded, transversely and alternately striate; suture irregularly impressed; whorls eight, convex; columella with two small folds; canal short, reflected; mouth ovate, two-fifths the length of the shell; outer lip sharp, within striate.

Length, .7, Breadth 7-20th, of an inch.

Observations.—A very pretty species, remarkable for its large folds and well marked transverse striæ, which are alternately larger and smaller. The striæ within are strongly marked.—[Lea, 1833].

This species may readily be confused with *Verconella bella* (Conrad). With the lens faint, alternate, spiral lines may be seen on *L. plicatus.* The secondary lines of this species are not so well developed as in *Streptochetus limula* (Conrad) which is also superficially like these species in general shape and sculp-

[531]Montfort, D., 1810, p. 531.

ture. *L. plicatus* may be distinguished by the presence of two small but distinct plications on the columella.

The callus on the columella is thin in the southern Eocene species of *Latirus* and in many cases the spiral ribs may be seen through the callus and appear like columellar plications. Besides the spiral ribs there are in many cases more than two, true plications on the columella. An example is *Turbinella fusoides* H. C. Lea.

Prof. Harris drew my attention to *Ruscula* Casey,[532] which was proposed for a new genus of *Pleurotoma*. Casey included under the genus, *Ruscula plicata* (Lea) and *Ruscula extricata* Casey with designating a type for the genus. The two species belong to *Latirus* and not in the *Turridæ*. The genus *Ruscula* is eliminated.

The figure by Lea of *plicata* is poor. A Meyer drawing of specimens from Conrad's collection of *plicata* is included herein.

Dimensions.—Height, 18 mm.; greatest diameter, 9 mm., holotype. Height, 15 mm.; greatest diameter, 9 mm. holotype, *Turbinella fusoides* H. C. Lea.

Holotypes.—No. 5744, Academy of Natural Sciences, Philadelphia, Pa.; No. 13166, A. N. S. *Turbinella fusoides* H. C. Lea.

Occurrence.—Lower Claiborne: locality 138. Gosport sand: locality 104 (type).

Latirus moorei (Gabb) Plate 54, figs. 2, 5, 9, 10, 14, 18; Plate 87, fig. 3

Fasciolaria moorei Gabb, 1860, Acad. Nat. Sci. Phila., 2d ser. Jour., vol. IV, p. 382, pl. 67, fig. 27.
Cordieria moorei Conrad, 1865, p. 22; Conrad, 1866, p. 16.
Latiris (*Cordiera*) *Moorei* Heilprin, 1891, p. 396.

Fusiform; whorls eight, spire acuminate; mouth half the length of the shell, outer lip crenate within, inner lip with one tooth at the upper part, columella nearly straight, with three or four nearly transverse folds, the anterior of which is somewhat tuberculous; surface marked by large nodes. seven on the body whorl, crossed by numerous, alternating, revolving lines; suture well marked but shallow.

Dimensions.—Length 1.5 in., length of mouth .75 in., width of body whorl .65 in.

This may possibly be identical with *F. plicata*, Lea, but it differs from his figure in being higher, more slender and in having a straighter canal.

This species appears to be common both at Wheelock and in Caldwell Co., Texas, but the specimens in my collection from the latter locality are of a larger average size than those from Wheelock, some of them being

[532] Casey, Thos. L., idem, p. 162, 1904.

twice as large as any I have ever seen from the other locality.—[Gabb, 1860].

The nucleus consists of three, smooth conical whorls, the fourth whorl may be partially smooth with longitudinal folds over the remaining portion of the whorl or it may be partly smooth, partly with longitudinal folds and the remaining portion of the whorl with longitudinal folds and spiral ribs.

This species is somewhat like *L. plicatus* (Lea) but differs from that species in having a shorter canal and spire. *L. moorei* has one or more, fine, intervening, spiral threads between the primaries. Occasionally an alternating spiral line occurs on *L. plicatus.* They are fine when they do occur and may be seen only with the lens.

This species as developed through its range is more commonly constricted just below the suture giving the appearance of a slight collar.

The species is abundant at localities 723, 741 and 766 where individuals of all stages of growth occur.

Latirus jacksonensis (Aldrich)[533] from Jackson Eocene is related and may be a variety of this form. From the illustration Aldrich's species does not have alternating spiral ribs or threads but Meyer's[534] figures of the same form show these.

Lectotype.—No. 13279, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 723, 724, 727, 728, 730, 731, 733, 743, 747, 765, 767 and 803.

Latirus sexcostatus Johnson Plate 54, figs. 3, 7

Latirus sexcostatus Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 74, pl. 1, fig. 9.

Shell fusiform, spire somewhat longer than the aperture and anterior canal, whorls nine, the three apical whorls smooth, the other with six longitudinal ribs, which are crossed on the spiral whorls by two prominent revolving ridges, on the body whorl the number is about ten, the interstices have numerous fine revolving raised lines and fine longitudinal lines of growth, interior of the outer lip with six short ridges and the columella with three small plaits. Length of type 14 mm., greatest diam, 6 mm., a larger but imperfect specimen has a diam. of 8 mm. and a probable length

[533]Aldrich, T. H., Cincinnati Soc. Nat. Hist., Jour. vol. VIII, p. 150, pl. 2, fig. 12, 1885; Aldrich, T. H., Geol. Sur. Ala., Bull. No. 1, p. 22, pl. 2, fig. 12, 1886 *Fasciolaria jacksonensis.*

[534]Meyer, O., Amer. Jour. Sci., vol. 29, p. 464, June 1885; Meyer, O., Geol. Sur. Ala., Bull. No. 1, pt. II, p. 74, pl. 2, figs. 20, 20a, 1886 *Latirus humilior.*

of 18 or 19 mm.

The type with eight additional specimens was collected by the writer from the Lower Claiborne at "Alabama Bluff", Trinity river, Houston Co., Texas. Specimens were also collected at Hurricane Bayou, Houston Co., Texas.—[Johnson, 1899].

The Harris collections contain typical specimens of this species from loc. 725. With them is a specimen which has an additional whorl, canal longer and a third, primary rib developed on the penultimate whorl. This specimen is figured herein. Postnuclear whorls 1, 2 and 3 have the typical two, primary spirals with fine, spiral threads over the entire surface of the shell. On typical specimens the initial stage of a third primary may be seen above the 2, well-developed primaries. The author believes that the specimen taken by Johnson for the holotype is an immature shell. With maturity the canal straightens and another primary rib develops on the penultimate whorl.

Holotype.—No. 9199, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 725 and 743.

Latirus extricatus (Casey) Plate 54, figs. 6, 16, 17

Ruscula extricata Casey, 1904, Trans. Acad. Sci. St. Louis, vol. XIV, No. 5, p. 162.

Form less stout, smaller in size, the spiral lyræ finer, separated by about twice their width on the convexity of the body whorl, the central of the fine intermediate threads more pronounced than in *plicata;* columellar plicæ very strong and much less oblique. Length of an equally well grown specimen of 5 body whorls, 13.5 mm.; width, 5.5 mm.—[Casey, 1904].

Prof. Harris turned over to the writer the photograph which had been made for him at the United States National Museum of the holotype of this species.

Holotype.—No. 494,369, United States National Museum, Washington, D. C.

Occurrence.—Gosport sand: locality 104.

Subgenus DOLICHOLATIRUS Bellardi, 1833[535]

(*Latirofusus* Cossmann, 1889).

Genotype by subsequent designation Cossmann, 1901[536], *Turbinella Bronni* Michtti. Miocene. Italy.

Latirus (Dolicholatirus) perexilis (Conrad)

Plate 54, figs. 1, 4, 11, 12; Plate 87, fig. 4

Turbinella perexilis Conrad, 1847, Acad. Nat. Sci. Phila., Jour. 2d ser. vol. I, p. 121, pl. 13, fig. 2; H. C. Lea, 1848, p. 106.

Cordieria perexilis Conrad, 1865, p. 23.

[535]Bellardi, L., I Molluschi dei terreni terziarzii del Piemonte e della Liguria, pt. IV, p. 38, 1884.

[536]Cossmann, M., Essais Pal. Comp., 4 liv., p. 23, 1901.

Latirus singleyi var. Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 71, pl. 6, fig. 13a.
Latirus harrisii Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 73, pl. 1, fig. 8.
Latirofusus perexilis (Conrad) Pilsbry, 1922, Acad. Nat. Sci. Phila., Proc., vol. 73, p. 346 *L. harrisi* Johnson synonym..

Narrow-fusiform, with convex volutions, having large, rounded, longitudinal ribs, about six on the large whorl; revolving lines strong, prominent, distant, with a fine intermediate line; longitudinal wrinkles minute and ornamental; aperture narrow; labrum striated within; columella with two large plaits; beak long and narrow. Length 1.

Distinguished from the preceding by its narrower outline, fewer and larger plaits on the pillar, &c. It is probably a much smaller species, but as I have one specimen only, its greatest size cannot be determined.—[Conrad, 1847].

Conrad's figure is poor. The Meyer drawing of the type is included.

Pilsbry believed the lower Claiborne *L. harrisi* Johnson which was the *L. singleyi* var. Harris, is the same as *L. perexilis* (Conrad), Vicksburgian.

Specimens have not been available for a study of this species. A specimen from Orangeburg, S. C. has a suggestive similar sculpture. The canal is not so straight as typical *L. perexilis.*

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 9739, A. N. S. *L. harrisi* Johnson; *L. singleyi* var. Harris, Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Texas (*L. harrisi* Johnson). Vicksburg Oligocene: *L. perexilis* (Con.).

Latirus (Dolicholatirus) singleyi Harris Plate 54, figs. 13, 15

Latirus singleyi Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 71, pl. 6, fig. 13, a.

Size and general form as shown by the figure; whorls 9? 4, 5, 6, 7, 8 marked by obtuse rounded ribs, which extend from suture to suture, by five strong, waving spiral lines on each whorl, and by fine, sharp, and even lines of growth most plainly visible between the costæ; body whorl with six obtuse costæ and about 24 raised spiral lines which, in the humeral region, consists of one strong series between which finer lines alternate, but below all become equal; lines of growth sharp and distinct, but fine; columella with two strong, oblique folds and a rudimentary one below; labium extending in a thin polished plate over the columella; umbilicus rudimentary.

Locality.—Elm Creek, Lee Co., Texas.
Geological horizon.—Lower Claiborne Eocene.
Type.—Texas State Museum.—[Harris, 1895].

Dimensions.—Height, 40 mm.; greatest diameter, 11.5 mm.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 732.

Latirus (Dolicholatirus) obtusus Johnson Plate 54, fig. 8

Latirus obtusus Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51. p. 73, pl. 1, fig. 7.
Latirofusus obtusus Pilsbry, 1922, Acad. Nat. Sci. Phila., Prov. vol. 73, p. 346.

Shell fusiform, with 6½ whorls including the nucleus, embryonic whorl large, smooth and obtuse, the following whorl commences with numerous longitudinal ribs, but soon assumes the general sculpture of the shell, which consists of six large rounded ribs on each whorl, which are crossed on the spiral whorls by eight revolving ridges, on the body whorl the revolving ridges exceed 30 in number, on the anterior portion they alternate and become very small, under the lens there is also visible, especially between the larger ribs, small longitudinal raised lines, representing probably lines of growth; columella shows but one small fold. Length 16 mm., greatest diam. 4 mm.

Two specimens collected by the writer, from the Lower Claiborne, at Hurricane Bayou, Houston Co., Texas.—[Johnson, 1899].

Holotype.—No. 9653, Academy of Natural Sciences, Philadelphia, Pa.

Genus **STREPTOCHETUS** Cossmann, 1889[537]

Genotype by original designation *Fusus intortus* Lamk. Eocene. France.

In shape, ornamentation and apertural characters *Streptochetus* is likely *Kelletia* (Bayle) Fischer. Cossmann distinguished the two by a difference in the nucleus.

Streptochetus limula (Conrad)
Plate 46, figs. 3, 4; Plate 86, fig. 2; Plate 87, fig. 7

Fusus limulus Conrad, 1833, Nov., p. 43; Conrad, App. in Morton, p. 6; Conrad, 1835, p. 53, pl. 18, fig. 4; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363; Harris, 1895, p. 24.
Fusus acutus Lea, 1833, Dec., p. 149, pl. 5, fig. 153; H. C. Lea, 1848, p. 100; Harris, 1895, p. 2.
Fusus ornatus Lea, 1833, p. 148, pl. 5, fig. 152; Conrad, 1834, App. in Morton, p. 6; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363; Conrad, 1865, p. 17 *Sipho;* Harris, 1895, p. 31 non d'Orbigny, 1843.
Strepsidura limula Conrad, 1865, p. 17; Conrad, 1866, p. 19; de Gregorio, 1890, p. 85, pl. 7, figs. 13-15, 18 [partim].
Streptochetus limula (Conrad) Cossmann, 1893, p. 36; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 31.

Fusiform, with spiral lines alternating in size and oblique nodiform costæ, which do not extend to the middle of the body whorl; volutions subangular; spire elevated, acute; beak short, reflected; aperture nearly half the length of the shell.—[Conrad, 1833].

Fusiform, with revolving lines alternated in size; angle of the whorls with thick slightly oblique tubercules; spire elevated, pointed; beak short, somewhat reflected.

Syn. F. ornatus, F. acutus, *Lea, Con. p.* 148, *pl.* 5, *f.* 152, 153.
Locality. Claiborne, Alab. No. 4, first ed. p. 43.—[Conrad, 1835].

[537]Cossmann, M., Ann. Soc. Roy. Mal. Belgique, tome XXIV, 4th ser. tome IV, p. 170, 1889.

The nucleus consists of three smooth, globular whorls, the first rather flatly coiled. The lower whorls of the nucleus lack the sharp shoulder of *Verconella bella.*

The distinguishing character of the sculpture is the alternating spiral thread. *S. limula* s. s. has the revolving lines rather coarse, the secondary thread may or may not be seen with the naked eye. The *Fusus ornatus* probably should be applied to the specimens having generally the same type of sculpture but more finely and delicately formed. As Conrad (1865) and Harris (1895) stated the more finely threaded form is a variety.

Dimensions.—Height, 19 mm.; greatest diameter, 10 mm., lectotype. Height, 16 mm.; greatest diameter, 8 mm., holotype *F. acutus* Lea. Height, 15 mm.; greatest diameter, 8 mm., holotype *F. ornatus* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia Pa. No. 5790, A. N. S., holotype *F. acutus* Lea. No. 5786, A. N. S., holotype *F. ornatus* Lea.

Occurrence.—Lower Claiborne: locality 728. Gosport sand: locality 104 (type).

"Streptochetus" conybearii (Lea) Plate 86, fig. 3

Fusus Conybearii Lea, 1833, p. 149, pl. 5, fig. 154; H. C. Lea, 1848, p. 100; Harris, 1895, p. 12. [suggested variety *Fusus limulus* Conrad].
Sipho conybearii (Lea) Conrad, 1865, p. 16.
Strepsidura conybearii (Lea) Conrad, 1866, p. 19.
Fusus (*Strepsidura*) *limula* de Gregorio, 1890 p. 85, [partim], pl. 7, fig. 16 non *F. limula* Conrad, 1833.

Shell subfusiform, furnished with longitudinal folds cut by rather large transverse striæ; substance of the shell rather thick; spire somewhat elevated, pointed; whorls six; canal rather short, oblique; mouth subovate; outer lip thickened, within crenate.

Length .4, Breadth .2, of an inch.

Observations.—This species resembles the two last. It is a smaller shell and differs in having broader striæ and a shorter and oblique canal.—[Lea, 1833].

This species differs from *S. limulus* (Conrad) in lacking intervening, spiral striations. The Meyer drawing of the lectotype is included herein.

Dimensions.—Height, 9 mm.; greatest diameter, 5 mm., holotype.

Holotype.—No. 5793, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala. (Lea).

Genus **LIROFUSUS** Conrad, 1865[538]

Genotype by monotypy *Fusus thoracicus* Conrad. Claibornian Eocene. United States.

Lirofusus thoracicus (Conrad) Plate 53, figs. 1, 2, 4, 5, 12; Plate 86, fig. 1

Fusus thoracicus Conrad, 1833, Sept., p. 30; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 54, pl. 18, fig. 6; H. C. Lea, 1848, p. 100; Harris, 1895, p. 46.

Fusus decussatus Lea, 1833, Dec., p. 145, pl. 5, fig. 146.

Lirofusus thoracicus Conrad, 1865, p. 17; Conrad, 1866, p. 19.

Fusus (*Lirofusus*) *thoracicus* de Gregorio, 1890, p. 86, pl. 6, figs. 26-29; non mut. *bicarinatus*=*Levifusus trabeatus* Con.

Lirofusus thoracicus Cossmann, 1893, p. 36; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 35, pl. II, fig. 1.

Fasciolaria errabunda de Gregorio, 1890, p. 78. pl. 6, figs. 6a-c variety.

Leucozonia errabunda (de Gregorio) Cossmann, 1893, p. 36.

Shell fusiform, with seven or eight revolving, elevated costæ on the body whorl, and longitudinal raised striæ; sutures deeply channelled; whorls six; two costæ on each whorl of the spire. Length about an inch.

Locality.—Claiborne, Alab.

Somewhat resembles *F. quadricostatus*, Say.

Cab. Acad. N. S.—[Conrad, 1833].

Fusiform, with 7 or 8 revolving elevated costæ on the body whorl, and longitudinal prominent striæ; sutures deeply channelled; costæ two on each whorl of the spire.

Syn. F. decussatus, *Lea, Con. p.* 145, *pl.* 5, *f.* 146.

Locality.—Claiborne, Alab. No. 3, first edition, p. 29.—[Conrad, 1835].

Nucleus consists of three smooth, globose, slightly pointed whorls; fourth whorl partly smooth and partly with large, longitudinal ribs.

This speceis varies in minor details at different localities. Specimens from the Gosport sand have the surface cancellated beautifully with the crossing of the longitudinal, finer lines over the heavy revolving costæ. On specimens from the lower stage at Orangeburg, S. C. the cancellation does not occur and the channeling at the suture is not deep as in the typical Claiborne forms. In the lower Claiborne at Newton, Miss. the carinæ have stronger and more distant nodes than the finely nodose specimens from Claiborne, Gosport sand.

Dimensions.—Height, 31 mm.; greatest diameter, 26 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5753 A. N. S., *Fusus decussatus* Lea holotype.

Occurrence.—Lower Claiborne: localities 707, 708, 726, 728, 734 and 741. Gosport sand: locality 104 (type).

[538]Conrad, T. A., 1865, p. 17.

Genus MAZZALINA Conrad, 1860[539]

(*Bulbifusus* Conrad, 1865)

Genotype by monotypy *Mazzalina pyrula* Conrad (=*M. inaurata pyrula* Conrad). Eocene. United States.

Bulbifusus Conrad, 1865[540], has been differentiated from *Mazzalina* Conrad, 1860 on the absence in *Bulbifusus* of numerous coarse plications on the columella and of the crenated inner margin of the labrum which is conspicuous on the type specimen of *Mazzalina*. The types of both groups have the finely nodose, apical whorls.

Harris pointed out in 1892 from a large collection of related specimens in the Eocene of Arkansas that *Bulbifusus* was merely a phase of *Mazzalina*. He figured specimens to show how the presence or absence of both columellar plications and labrum crenulations vary. The evidence seems to indicate that the forms are all the same, with minor varietal differences. *M. inaurata* stands for the species. The type specimen is a form with a long, recurved canal. The length of the canal is not consistent. Many specimens of *inaurata* have the canal as short as in *Mazzalina pyrula* s. s.

Mazzalina inaurata (Conrad) Plate 47, figs. 1, 7; Plate 86, fig. 8

Fusus inauratus Conrad, 1833, Sept., p. 29; Conrad, 1835, p. 53, pl. 18, fig. 2; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363.

Fusus Fittenii Lea, 1833, Dec., p. 150, pl. 5, fig. 156; H. C. Lea, 1848, p. 100.

Bulbifusus inauratus Conrad, 1865, p. 17; Conrad, 1866, p. 18; Aldrich, 1886, Geol. Sur. Ala., Bull. No. 1, p. 23, pl. 6, fig. 11; de Gregorio, 1890, p. 88, pl. 6, figs. 33-36, 38; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 81, pl. 3, figs. 6, 7; non Heilprin, 1891, p. 396 [partim].

Strepsidura inauratus (Conrad) Cossmann, 1893, p. 35.

Mazzalina inaurata (Conrad) Harris, 1892, Ark, Geol. Sur. Ann. Rept. State Geol. vol. II, p. 164, pl. VII, fig. 6; non var. Harris, 1896, Acad. Nat. Sci. Phila., Proc. vol. 48, p. 48, fig. 14.

Shell ventricose, smooth unarmed; suture of the body whorl somewhat channelled; spire short, pointed, with small tubercles near the summit; beak slightly curved, rather open. Length 1 inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Subfusiform, ventricose, smooth; suture profound, margined beneath by a prominent line; spire short, pointed, with a crenulated line on the whorls near the apex; beak flexuous.

Syn. F. fittonii, *Lea. Con. p.* 150, *pl.* 5, *fig.* 156.

[539]Conrad, T. A., Acad. Nat. Sci. Phila., Jour. 2d ser. vol. IV, p. 295, 1860.

[540]Conrad, T. A., Amer. Jour. Conch., vol. 1, p. 17, 1865. Monotype *B. inauratus* (Conrad).

Locality.—Claiborne, Alab.
Allied to *F. ficulneus* Lam. but differs in having a less elevated spire, a marginal carina and crenulations on the whorls, &.
No. 3, first ed. p. 29.—[Conrad, 1835].

Fusus minor and *parvus* Lea have been identified as the young of this species but they are not. They have a higher spire and lack the small but distinct tubercles on the apical whorls. They are the young of *Leiorhinus prorutus* Con.

This species has also been identified with specimens of similar nature from the middle or upper Eocene of White Bluff, Ark. Other associated specimens of the species are *Mazzalina oweni* Dall and varieties by Harris.

Dimensions.—Height, 35 mm.; greatest diameter, 20 mm., holotype. Height, 22 mm.; greatest diameter, 14 mm., holotype *Fusus fittonii* Lea.

Occurrence.—Claibornian or lower Jacksonian: White Bluff, Ark. Gosport sand: locality 104 (type).

Mazzalina inaurata pyrula Conrad — Plate 85, fig. 13

Mazzalina pyrula Conrad, 1860, Acad. Nat. Sci. Phila., Jour. 2d ser. vol. IV, p. 295, (non pl. 9, fig. 1); Conrad, 1865, p. 23; Conrad, 1866, p. 32; de Gregorio, 1890, p. 71, pl. 6, fig. 1 under *Turbinella* [copy of Tryon which Dall cf. *M. costata* Dall, 1890, p. 106]; Harris, 1892, Geol. Sur. Ark., Ann. Rept. State Geol., vol. II, p. 165, pl. 7, fig. 2 [*inaurata?* var.]; Cossmann, 1893, p. 35 [spelled *pirula*]; Cossmann, 1902, Essais Pal. Comp., 4 liv., p. 51.

Pyriform, moderately thick in substance; spire conical whirls [sp.] carinated below the suture; columella with eight plaits; beak slightly recurved; labrum with prominent, acute lines within.
Length 1½ inches. Diameter 1 inch.—[Conrad, 1860].

The *Mazzalina pyrula* s. s. represents the form with shorter canal and spire, coarse plications on the columella and crenulations on the inner margin of the labrum. There are many specimens of *M. inaurata* s. s. with canal of the same length as *pyrula*.

Dimensions.—Height, 40 mm.; greatest diameter, 26 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Mazzalina inaurata dalli Harris — Plate 47, figs. 5, 6

?*Macron* sp. Dall, 1890, p. 106; in Call, 1889, Ann. Rept. Geol. Sur. Ark., vol. II, p. 88, foot-note.

Mazzalina dalli Harris, 1892, Ann. Rept. Geol. Sur. Ark., vol. II, p. 166, pl. 7, fig. 7.

Shell short, fusiform; whorls about five, convex, with a well marked constriction just below the suture; aperture a little over one half the length of the shell, somewhat constricted above; canal short, nearly straight; columella smooth; interior of labrum smooth or containing acute, more or less interrupted striæ; shoulder or constriction, and lower part of body whorl marked by revolving lines; upper whorls of spire coarsely nodose; fine sinuous lines of growth appear over the whole surface, but are more noticeable at resting stages in the growth of the shell.

This may possibly prove to be but a small diseased form of *Mazzalina inaurata*.

Localities:

Station 2234, 2403, three quarters of a mile above Vice Bluff, Saline River.

? White Bluff, Arkansas River. *Macron* of Dall?—[Harris, 1892].

Dimensions.—Height, 13+ mm.; greatest diameter, 8 mm., holotype (from original drawing).

Holotype.—No. 135131, United States National Museum, Washington, D. C.

Occurrence.—Claiborne and Jackson Eocene: Arkansas.

Mazzalina inaurata oweni (Dall) Plate 47, figs. 2, 8, 11

Fusus sp. Owen, 1860, Second Geol. Rept. Ark., p. 35, pl. 9, fig. 1.

Fasciolaria oweni Dall in Call, 1889, Ann. Rept. Geol. Sur. Ark., vol. II, p. 8, foot-note; Harris, 1892, Ann. Rep. Geol. Sur. Ark., vol. II, p. 165, pl. 7, fig. 1.

Mazzalina oweni Dall, 1890, p. 105; Dall, 1892, ibid, pt. II, p. 233.

White Bluff, Jefferson Co., Arkansas, Middle Eocene.

Owen's types were deposited in the National Museum, and are before me as I write. The specimens, except when fully adult, show the plaits on the pillar only to an oblique view, so they do not appear on that figure. When the young species has three plaits on the pillar like *Fasciolaria*. At the first resting-stage, however, more are added, and thereafter are continuous, increasing to eight or nine in the fully mature shell; the surface is much like that of Conrad's type-species, but the shell is smaller and more slender; the young have the suture crenulated minutely by its being laid on a peripheral crenulated keel of the first two or three whorls; this keel becomes faint and smooth on the later whorls, obscurely indicating a shoulder to the whorls, which number in all about seven, with the outer lip internally callus and lirate. The nucleus is small and fusoid; the canal spirally striate externally. The adult measures 34x19 mm.; Owen's figure is somewhat too slender. It is doubtless the species referred to on page 35 as *Fusus Fittoni* (Lea), to which it bears a considerable but wholly superficial resemblance. Most of the specimens are obscurely constricted between the suture and the shoulder, which is not well shown by Owen's figure. The species has since been collected by the State Geological Survey under Dr. John C. Branner at the same locality and is accompanied by a species of *Macron* of rather similar external form. *Lagena rhomboidea* Gabb (Geol. St. Dom., p. 218, 1873) is, from the types, a young *Mazzalina* much resembling *M. Oweni*, but more slender and with a proportionally longer canal.—[Dall, 1890].

Holotype.—No. 135103, United States National Museum, Washington, D. C.

Occurrence.—Claibornian or lower Jacksonian: White Bluff, Ark.

Mazzalina inaurata humerosa Harris Plate 47, fig. 10

Mazzalina inaurata humerosa Harris, 1892, Ann, Rept. Geol. Sur. Ark., vol. II, pl. 7, fig. 4 [under *M. inaurata* p. 165].

Dimensions.—Height, 16.5+ mm.; greatest diameter, 11+ mm., holotype (from drawing).

Holotype.—No. 135130, United States National Museum, Washington, D. C.

Occurrence.—Claibornian or lower Jacksonian: Rison, Ark. (Harris).

Genus **FUSINUS** Rafinesque, 1815

Fusus Lamarck, 1799, non *Fusus* Helbing, 1779.
Fusinus Rafinesque, 1815, p. 145 for *Fusus* Lamarck.
Fusus Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417.
Fusinus Dall, 1909, p. 36; Iredale, 1910, Proc. Mal. Soc. Lond., vol. IX, p. 262.

Genotype by monotypy of *Fusus* Lamarck, *Murex colus* Linnæus. Living. Indo-Pacific.

The species of fusoid shells in the Eocene of eastern and southern United States which superficially are like *Fusinus* in the long tapering shape and in the sculpture were called *Fusus* (*Fusinus*) until Dr. Grabau[541] studied the nuclei and compared them with that of *Fusus*=*Fusinus*. He found the nuclei distinct and differentiated the species under the generic name *Falsifusus*.

Fusinus has a nucleus of one and a half, rarely two, volutions. The first whorl is smooth, the first half of the second whorl or last of nucleus has fine, vertical ribs with sometimes fine, revolving lines. The nucleus ends abruptly with a varix and the sculpture of the young shell begins at that point.

The nucleus of *Falsifusus*, typified by *F. ottonis* Aldrich of the Sabine Eocene, consists of three, sometimes four, whorls, the first two of which are smooth. The first whorl is minute. Oblique riblets occur on the third whorl or fourth. The following whorls develop directly the ornamentation of the species. There is no distinct line between the sculpture of the nucleus and the post-nuclear whorls.

True *Fusinus* has not been found so far in the Eocene of the

[541]Grabau, A. W., Smith. Misc. Coll., vol. 44, No. 1417, 1904.

southern and eastern United States. It is represented in the English and Paris Eocene Basins by several species.

Genus **FALSIFUSUS** Grabau, 1904[542]

Genotype by original designation *Fusus ottonis* Aldrich (=*F. meyeri* Aldrich, 1886 non *F. meyeri* Dunker, 1869). Sabine Eocene. United States.

Falsifusus bastropensis (Harris) Plate 48, figs. 6, 10, 11

Fusus bastropensis Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 71, pl. 7, fig. 2.

Size and general form as indicated in the figure; whorls 13 or 14; 1 and 2 very minute, smooth, 3 and 4 transversely costate, 5-12 with nodose obtuse ribs, distinct in 5, 6, etc., but less marked in 11 and 12, crossed by six or seven spiral raised lines, coarse or strong near the base of each whorl; one spiral line, generally the second from the base forms a slight carination on the whorls; body whorl with broad nodulations, about seven in number, and with strong spiral raised lines, the two on the largest part of the whorls being largest, above which there are two or three well-marked lines and below which to the end of the canal the lines gradually decrease in size and are more or less alternating; labrum, as far as observed, non-striate within; columella long, smooth, and straight.

This resembles samewhat *F. meyeri* Ald.

Localities.—Smithville, Bastrop Co., Tex. Also in Claiborne and Bienville Parishes, La.

Geological horizon.—Lower Claiborne Eocene.

Type.—Coll. of G. D. Harris.—[Harris, 1895].

Falsifusus ottonis (Aldrich) is like this species but differs in spiral sculpture. *F. ottonis* has the third, spiral rib from the suture more enlarged than the other spiral ribs and it is carinate. The second, spiral rib from the suture in *F. bastropensis* is slightly more enlarged than the others but not to the extent of the carinated rib in *F. ottonis.* The longitudinal folds in *F. ottonis* are pinched up more than *F. bastropensis* and become like varices. A projection of the nodes is formed where the enlarged, spiral rib crosses the longitudinal node. The nodes in *F. bastropensis* are regularly rounded. *F. ottonis* is extremely close to *F. unicarinatus* Deshayes[543] of the Ypresian of France and has been regarded by Cossmann as identical.[544]

The difference between the character of the longitudinal folds in *F. bastropensis* and *ottonis* may not be consistently true at all localities. Typical specimens at Smithville, Texas do not have the folds varicose but specimens from Stone City, Texas show

[542]Grabau, A. W., 1904, p. 80.

[543]Deshayes, G. P., Desc. Coq. Fos. env. Paris, tome II, p. 515, pl. 72, figs. 11, 12, 1835.

[544]Cossmann, M., 1893, p. 37.

the folds constricted as much as *F. ottonis*. The differences between the spiral ribbing of the two species remain constant.

The nuclei of the specimens in the Harris collection are broken.

Cossmann[546] confused the names *Fusus bastropensis* Harris and *Astyris bastropensis* Harris[547] in his discussion of *Ptychatractus*. He meant *Astyris bastropensis* on p. 53, as well as on p. 54, but he wrote *Fusus bastropensis*. It is an error to refer *Astyris bastropensis* as he did on p. 54 to the Midway Eocene. That species is lower Claibornian.

Dimensions.—Height, 36 mm.; greatest diameter, 9 mm.

Holotype.—No. 2356, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 724, 726, 728, 733 (type), 741 and 766.

Falsifusus ludovicianus (Johnson) Plate 48, figs. 7, 13

Fusus ludovicianus Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 72, pl. 1, fig. 5; Cossmann, 1906, Essais Pal. Comp., 7 liv., p. 226.

Falsifusus ludovicianus (Johnson) Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, p. 82, pl. 18, fig. 1, text. fig. 6.

Shell with eleven very convex whorls, the two apical whorls smooth, the following whorl with numerous oblique longitudinal ridges, which soon assume the general sculpture of the shell, spiral whorls with six revolving ridges, the two lower ones the most prominent, on the body whorl are 23 revolving ridges, the six large longitudinal ribs on each whorl are interrupted by a broad deep sutural area. Length of the type 29 mm., greatest diam. 9 mm.

One specimen collected by the writer from the Lower Claiborne at St. Maurice, Winn Parish, La.—[Johnson, 1899].

Holotype.—No. 9488, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 725 and 727.

Falsifusus ? houstonensis (Johnson) Plate 48, figs. 8, 12

Fusus houstonensis Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 72, pl. 1, fig. 4; Cossmann, 1906, Essais Pal. Comp., 7 liv., p. 226.

Falsifusus ? houstonensis (Johnson) Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, p. 83, fig. 7.

Shell showing eight convex whorls, which are somewhat angular toward the apex (apical whorl wanting), whorls with eight prominent longitudinal ribs, and eight revolving ridges on the spiral whorls, the body whorl has about 30 revolving ridges, which become smaller on the anterior portion, the two peripheral ridges are more prominent, between and above which are small intermediate raised lines, these are obsolete or wanting between the other ridges. Length of the type specimen 44 mm., greatest diam. 14 mm.

[546]Cossmann, M., Essais Pal. Comp., 4 liv., p. 53, 1901.

[547]Harris, G. D., Acad. Nat. Sci. Phila., Proc. vol. 47, pp. 71, 74, pl. 7, fig. 2, and pl. 8, fig. 2 respectively, 1895.

Collected by the writer from the Lower Claiborne at "Alabama Bluff," Trinity river, Houston Co., Texas.—[Johnson, 1899].

Holotype.—No. 6877, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality 727.

Falsifusus ? apicalis (Johnson) Plate 48, fig. 5

Fusus apicalis Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 71, pl. 1, fig. 3; Cossmann, 1906, Essais Pal. Comp., 7 liv., p. 226.
Falsifusus ? apicalis (Johnson) Grabau, 1904, Smith, Misc. Coll., vol. 44, No. 1417, p. 83, pl. 18, fig. 2, text fig. 8.

Shell with ten convex whorls, apical whorl smooth, and the three subapical whorls with numerous fine longitudinal raised lines, but no revolving sculpture, the other six whorls with six large longitudinal ribs, these are crossed by seven revolving ridges on the spiral whorl and about 22 on the body whorl; the second and third ridges below the suture somewhat smaller than the others; between the longitudinal ribs and on the narrow anterior portion of the body whorl the revolving ridges become nodulose. Length 31 mm., greatest diam. 10 mm.

Three specimens collected by the writer from the Lower Claiborne at "Alabama Bluff," Trinity river, Houston Co., Texas.

This locality, which is fifteen miles southwest of Crockett, is better known as Alabama Crossing.—[Johnson, 1899].

Holotype.—No. 6878, Academy of Natural Sciences, Philadelphia, Pa.

"Falsifusus" perobliquus (Johnson) Plate 48, fig. 9

Fusus perobliquus Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 72.

Whorls very oblique and angular (apical and body whorls wanting) with seven longitudinal ribs on each whorl and nine revolving ridges, one on the angle of the periphery, five above and three below, the one at the suture very small and becoming obsolete on the upper whorls, the second one below the suture about one-half the size of the others, between the ridges the lens shows very fine revolving and longitudinal lines. Length of specimen 25 mm., diam. 9 mm.

One specimen collected by the writer from the Lower Claiborne at Moseley's Ferry, Brazos river, Burleson Co., Texas.—[Johnson, 1899].

Through the courtesy of Miss Helen Winchester, of the Academy of Natural Sciences, Philadelphia, a photograph of the holotype is here included.

Holotype.—No. 9167, Academy of Natural Sciences, Philadelphia, Pa.

Genus **EXILIFUSUS** Conrad, 1865[548]

(Non *Exilifusus* Gabb, 1876)

Genotype by monotypy *Fusus thalloides* Conrad. Claibornian Eocene. United States.

[548]Conrad, T. A., 1865, p. 18.

Exilifusus thalloides (Conrad) Plate 48, figs. 2, 4; Plate 87, figs. 5, 6

Fusus thalloides Conrad, 1833, Sept., p. 43; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 56, pl. 18, fig. 12; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363; Harris, 1895, p. 45.
Fusus pulcher Lea 1833, Dec., p. 144, pl. 5, fig. 144; de Gregorio, 1890, p. 82, pl. 7, fig. 21.
Exilifusus thalloides Conrad, 1865, p. 18; Conrad, 1866, p. 19; de Gregorio, 1890, p. 89, pl. 6, fig. 41.
Latirofusus pulcher Cossmann, 1893, p. 37.
?Ptychatractus thalloides (Conrad) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 54.
Dolicholathyrus pulcher (Lea) Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 24.

Narrow-fusiform, with rather distant, spiral, elevated striæ; spire subulate, longer than the beak; superior volutions with obscure longitudinal undulations; aperture small, elliptical; beak straight; channel contracted. —[Conrad, 1833].

Narrow-fusiform, with rather distant spiral elevated striæ; spire subulate, elongated, superior whorls with obscure longitudinal undulations; aperture small, elliptical; labium reflected; beak straight, channel contracted.

Locality.—Claiborne, Alab. No. 4, first ed. p. 43.—[Conrad, 1835].

Dimensions.—Height, 22 mm.; greatest diameter, 8 mm., lectotype. Height, 18 mm.; greatest diameter, 8 mm., holotype *Fusus pulcher* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5748, holotype *Fusus pulcher* Lea.

Occurrence.—Gosport sand: locality 104.

"Fusus" subfilosus Aldrich Plate 48, fig. 1

Fusus subfilosus Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 14, pl. 2, fig. 2.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Claiborne, Ala.

Genus CLAVILITHES Swainson, 1840[549]

(*Clavella* Swainson, 1835[550])

Genotype by subsequent designation, Grabau, 1904[551], *Clavil-*

[549]Swainson, Wm., 1840, p. 304 the name is spelled *Clavilithes* on the page where it is described (p. 304) but on pp. 90, 93, 94 and 95 of the same book, it is spelled *Claralithes* five times inclusive. However the latter will be a *lapsus calami*.

[550]Swainson, Wm., Elements of Modern Conchology, 1835 preoccupied by Oken, 1815 for a crustacean.

[551]Grabau, A. W., 1904, pp. 105, 111. The *C. longævus* (Deshayes) in Swainson was determined by Cossmann, 1899, p. 173 and Grabau as not the *C. longævus* (Solander) in Brander, hence the type designations of *Clavilithes* by Gray, 1847, p. 137 and H. and A. Adams, 1855, vol. I, p. 86 are not valid.

ithes parisiensis (Mayer-Eymar) (=*Clavilithes longævus* (Deshayes) non Solander). Eocene. France (typical). England.

Clavilithes raphanoides (Conrad) Plate 56, fig. 9

Fusus raphanoides Conrad, 1834, Jour. Acad. Nat. Sci. Phila., vol. VII, p. 144; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 54, pl. 18, fig. 8; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363.
Clavella raphanoides Conrad, 1865, p. 18; Conrad, 1866, p. 19; de Gregorio, 1890, p. 89, pl. 6, fig. 46; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 20 *rapanoides.*
Clavilithes raphanoides (Conrad) Cossmann, 1893, p. 36; Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, p. 130.

Shell fusiform, entire; whorls of the spire obliquely flattened above; suture profoundly impressed; body whorl large, convex, abruptly rounded beneath; aperture not expanded, suddenly contracted near the summit and on the beak; beak long, straight. Length two inches and two-thirds.
Locality.—Claiborne.—[Conrad, 1834].

As has been pointed out by De Gregorio and Grabau, this species is of the type of shell of *C. egregius* (Beyrich). See Grabau[552] for a discussion of that species. This group lacks the development of longitudinal nodes. The species seems to have revolving sculpture absent.

The apical whorls of this species are not known. The smooth penultimate and body whorl suggest *C. pachyleurus* Conrad. That species has a slight concavity just below the suture which is not noticeable on *C. raphanoides. C. raphanoides* might be a gerontic *pachyleurus.*

Dimensions.—Height, 51 mm.; greatest diameter, 25 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Clavilithes? protextus (Conrad) Plate 56, fig. 10

Fusus protextus Conrad, 1833, p. 43; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 54, pl. 18, fig. 7; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363; Conrad, 1865, p. 16.
Fusus salebrosus Conrad, 1834, Acad. Nat. Sci. Phila., Jour. VII, p. 145; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, pl. 18, fig. 13; d'Orbigny, 1850, p. 363; Conrad, 1865, p. 16.
Fusus (*Turrispira*) *salebrosus* Conrad, 1866, p. 19; de Gregorio, 1890, p. 90, pl. 7, fig. 19.
Fusus (*Turrispira*) *protextus* (Conrad) de Gregorio, 1890, p. 90, pl. 7, fig. 1.
Fusus protextus (Conrad) Harris, 1895, p. 37.
Fusus salebrosus (Conrad) Harris, 1895, p. 40.

[552]Grabau, A. W., idem, p. 123, 1904.

Clavilithes protextus Cossmann, 1893, p. 36.
Clavella salebrosus Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 20.
Clavilithes ? salebrosus Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, p. 133.

Fusiform; volutions six or seven; those of the spire longitudinally costated, and spirally striated; whorls indented below the suture; body whorl short and abruptly rounded; beak straight, and much elongated.—[Conrad, 1833].

Fusiform, revolving lines prominent, distinct; whorls of the spire, except near the summit, with longitudinal undulations; apex obtuse or papillated; body whorl obscurely biangulated, abruptly contracted inferiorly; beak straight, much elongated.

Locality.—Claiborne, Alab.—[Conrad, 1835].

Conrad gave two names to two stages of growth of the same species. *C. protextus* represents the adult stage and the name has priority in publication.

Dimensions.—Height, 87 mm.; greatest diameter, 33 mm., lectotype *C. protextus*. Height, 50 mm.; greatest diameter, 19 mm., lectotype *C. salebrosus*.

Lectotypes.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Clavilithes pachyleurus (Conrad) Plate 56, figs. 1, 2

Fusus pachyleurus Conrad, 1839, Acad. Nat. Sci. Phila., Jour. vol. VIII, p. 190; Conrad, 1841, Acad. Nat. Sci. Phila., Proc. vol. 1, p. 33; Conrad, 1847, ibid, 2d ser. Jour. vol. 1, p. 132, pl. 14, fig. 25; H. C. Lea, 1848, p. 100.
Clavella pachyleura Conrad, 1865, p. 18; Conrad, 1866, p. 19; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 20.
Fusus (*Clavella*) *conjunctus* Desh. var. *pachyleurus* de Gregorio, 1890, p. 88, pl. 6, fig. 45.
Clavilithes pachyleurus (Conrad) Cossmann, 1893, p. 36; Grabau, 1904, Smith. Misc. Coll., vol. 44, p. 129.

Fusiform, thick, with spiral striæ not very distinct; whorls of the spire concave above, convex, and with obtuse ribs below, except upon the lower whorl which is entire; body whorl also destitute of ribs, abruptly rounded or subangular at base, ventricose; beak long, thick, straight; labium widely reflected; channel contracted.

Length 2½ inches.

Presented by Mr. Nicollet. It is from the Lower Tertiary of Alabama. —[Conrad, 1839].

C. pachyleurus differs from *C. humerosus* (Conrad) of the Jackson Eocene by having a shorter spire and more longitudinal nodes. There are from ten to twelve nodes on the Claiborne form and about eight on the Jackson. Revolving lines are almost entirely lacking on the *C. pachyleurus*. They may show faintly on the upper part of the whorls. Spiral lines are well developed over the upper whorls of the spire and lower portion of the body whorl of *C. humerosus*. The middle part of the whorls of that species is smooth or the lines show faintly.

C. conjunctus (Deshayes) of the Lutetian of the Paris Basin is the equivalent or parallel of *C. pachyleurus* apparently. It differs from the American species in that the revolving lines on the spire are more conspicuous and the longitudinal nodes are less well developed.

Dimensions.—63 mm., height (apex broken); 22 mm., greatest diameter.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Clavilithes penrosei (Heilprin) Plate 55, figs. 1, 3, 4, 6

Clavella (*Fusus?*) *penrosei* Heilprin, 1891, Acad. Nat. Sci. Phila., Proc. vol. 42, pp. 395, 405, pl. XI, fig. 1.

Shell large, turbinate, with a greatly elongated canal; whorls scalariform, depressed, broadly flattened and slightly hollowed on the shoulder; no revolving lines, but wrinkles of growth faintly indicated; beak nearly (or fully?) the length of the spire, and twisted at about its middle somewhat as in *Fulgur;* canal narrow, tortuous in its upper half.

Length of full-grown specimen probably 8-10 inches.

Station 2, Rio Grande. Fragments of two specimens. The species is manifestly of the type of which *Fusus longævus,* of Brander (Sowerby), belongs, although in that species the canal and columella are nearly straight; to the same type also belong *Clavella humerosa,* of Conrad, from the Alabama Eocene. I cannot tell from my specimens whether a posterior canal is present or not, but the general similarity of the shell to the forms first referred to, in which such a canal is present, leads me to infer that it also exists in this species.

The species differs from *Fusus longævus,* apart from the character presented by the columellar arcuation, in the broader and more depressed whorls, and in the very considerable inferior flattening of the body-whorl. I have compared it with Sowerby's type (Mineral Conchology, 1, p. 141, table LXIII), which is contained in the collections of the Academy.

Named after Dr. R. A. Penrose, Jr., to whom I owe most of the material which has been submitted to me for examination.—[Heilprin, 1891].

The nucleus consists of three, smooth whorls; apex twisted vertically to a point; fourth whorl begins smooth, followed with a few longitudinal ridges which extend the length of the whorl, the whorl merges into the normal sculpture of the conch.

Heilprin described an adult specimen and figured a restoration. The figure of the restoration does not give the spire great enough length according to a specimen which has nearly a complete spire and the younger specimens in the collection at hand. A large, nearly complete specimen of the species collected by G. D. Harris, is figured herein. The immature specimens show a high spire completely covered with fine, revolving lines which have interspaces of equal width. The whorls have from five to seven, large longitudinal nodes.

Holotype.—Not found[553].

Occurrence.—Lower Claiborne: localities 724, 728, 733 and 741.

Clavilithes regexus Harris Plate 55, fig. 7

Clavilithes regexus Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 73, pl, 7, fig. 6.

This species is too poorly represented in the collection of the Survey to admit of complete characterization specifically. It is comparable in size with *C. penrosei* Heilp., and resembles the latter in the lower part of the whorls and in the long, smooth columella. Above, however, it shows no traces of a shoulder, the whorls are slightly flattened laterally, and are smooth and polished.

Localities.—Near McBee School-house, Cherokee Co.; between Orrell's and Evergreen Crossing, Elm Creek, Lee Co.; 2 miles west of Crockett, Houston Co.; Berryman Place, Kimble Headright, Cherokee Co.; 3 miles north of Crockett, Houston Co.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Collection.—[Harris, 1895].

When a more perfect specimen is found with the whorls of the spire preserved, the relationship of the species may be worked out.

Holotype.—Formerly at the Geology Department, University of Texas, Austin, Texas. Probably lost.

Occurrence.—Lower Claiborne: localities 725, 733 and 741.

Clavilithes kennedyanus Harris Plate 56, figs. 4, 6, 7, 11, 13

Clavilithes kennedyanus Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 73; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 44, pl. 5, fig. 8 var.; Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, p. 131, fig. 17.

General form as figured; whorls 10 or 12; 1 and 2 probably smooth; 3 - 10 with nodular ribs most prominent on the lower portions of the whorls, crossed by raised spiral lines and by even lines of growth; body whorl in the type specimen very poorly preserved, but showing few signs of costæ; columella ponderous.

Locality.—Smithville, Bastrop Co., Texas.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The numerous species of American Eocene species of *Clavilithes* would make a fine ontogenic series for study continuing the work begun by Grabau. This ought to be accomplished before the determination of the species can be made with cer-

[553]Search was made at the Academy of Natural Sciences, Philadelphia, Pa., and at the Geology Department, University of Texas, Austin, Texas.

tainty. Many species attain a large size. Unfortunately the large, perfect specimens are rarely preserved. Therefore without the apical whorls in place, the complete sequence of ornamentation is difficult to trace and may lead to misplacing of young and adult shells.

The figure Harris drew of *kennedyanus* appears to be a stout individual while the average of the species is a more slender shell. Numerous specimens at the same locality show a variation from the stout shape. They are slender with ornamentation completely covering the shell. A gerontic specimen was figured by Harris from the Sabine (Wilcox) Eocene.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Sabine: Woods Bluff, Nanafalia, Choctaw Corner and Thomasville, Ala. variety. Lower Claiborne: localities 731, 733 and 803.

Clavilithes chamberlaini Johnson and Grabau Plate 55, figs. 2, 5

Clavilithes chamberlaini Johnson and Grabau, 1901, Acad. Nat. Sci. Phila., Proc. vol. 53, p. 602, text figures; Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, p. 132.

The spire of this species is long and slender, as in *C. kennedyanus* Harr., with which the early whorls of the shell agree pretty well. Only a portion of the protoconch has been observed, but it is apparently of the same character as that of the American species of this genus generally, unless more slender than the normal. The spire contains about seven ribbed whorls; the suture is moderately depressed; the ribs are swollen near the middle, but become obsolete toward the suture; they are at first more than their width apart, but later become broader and the interspaces correspondingly narrower. A subsutural band occurs, and is quite strongly marked on the later ribbed whorls, indicating a pronounced posterior canal at this stage.

Spirals on the first five whorls, single, coarser in the center, but becoming finer toward the sutures; interspiral spaces broader than the spirals. Intercalation of secondary spirals begins on the sixth whorl. On the seventh whorl the ribs become broad and ill defined, tending toward obsolescence. Before they have quite disappeared, a sutural shelf sloping somewhat outward and bordered by a slightly outward projecting margin appears; this very soon develops into a serrated flange. At the same time the whorls become almost smooth, the spirals usually only occurring on the narrowed anterior portion or canal of the body whorl. Length of the adult specimen figured 39 mm., diameter 18 mm.

This is a parallel species to *C. scalaris* Lam. of the Paris Basin (Calcaire Grossier) and *C. longævus* Sol. of the London Clays (Barton Beds). Compared with *C. humerosus* variety *texanus* Harris it has more ribs on the spire, which are more regular and bulging, stronger spirals and the well-marked serrated flange. It also differs somewhat in outline, the last whorl being broader than the corresponding one of *texanus*. It differs from its European parallels in many features, chief of which are the protoconch, the long-ribbed spire, the character of the sutural shelf and flange, and other points readily seen on comparison.

From the Lower Claibornian Eocene. Bald Mound. nine miles southeast of Jewett, Leon County, Texas.

Type No. 9,409, "Isaac Lea Collection of Eocene Mollusca", Academy of Natural Sciences of Philadelphia. This species is respectfully dedicated to Rev. L. T. Chamberlain, D.D., Curator of the Isaac Lea Collection.—[Johnson and Grabau, 1901].

Clavilithes columbaris Aldrich — Plate 56, fig. 5

Clavilithes columbaris Aldrich, 1903, Nautilus, vol. XVI, No. 9, Jan., p. 98, pl. III, fig. 7.

Shell fusiform, whorls ten, apex bulbiform, consisting of three whorls, the third constricted; the next four spirally striated and turberculated, the last two strongly turreted and excavated below the sutural shoulder. Aperture small, constricted at posterior. Canal long, narrow.

Length of figured specimen 52 mm.

Localities: Claibornian of De Soto and McLeod's Mill, Miss., also in West Alabama, same horizon. This species approaches the form described by Harris as *Clavilithes humerosus* Con., var. *texanus*, but the size and extremely prominent shouldered whorls and the constriction below are peculiar. The figured example is the most perfect one obtained, but the shoulder is even more prominent in other specimens. On comparing this species with *C. longævus* Lamarck, I find it has one less embryonic whorl and a higher spire.—[Aldrich, 1903].

Holotype.—Not found[554].

Clavilithes texanus Harris — Plate 56, figs. 3, 12

Clavilithes humerosus Conrad var. *texanus* Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 73, pl. 7, fig. 7.

Clavilithes texanus (Harris) Grabau, 1904, Smith. Misc. Coll., vol. 44, No. 1417, p. 130.

Differs from typical *humerosus* in having the sides of the body whorl nearly rectilinear, in having a more prominent shoulder at the suture, and in being of a smaller size generally. Many specimens approach closely *Clavilithes longævus* of the middle Eocene of Europe.

Localities.—Near McBee school-house, Cherokee Co.; Alum Creek Bluff, Colorado River, Bastrop Co.; Wilson Reid Headright, Brazos Co.; Hurricane Bayou, Hodge's Headright, Houston Co.; northwest corner of Madison County; Collier's Ferry, Burleson Co.; Collard farm, Spark's Headright, Brazos Co., Tex. Also in Claiborne and Bienville Parishes, La., and 2½ miles east of Newton, near Enterprise, Miss.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

A figure (plate 56, fig. 8) of *C. humerosus* Conrad of the Jackson is included herein for comparison.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 725, 733 and 741.

[554]Search was made in the Geology Department, Johns Hopkins University, Baltimore, Md., and in the Alabama Museum of Natural History, University, Ala.

Genus PAPILLINA Conrad, 1855

Papillina Conrad, 1855, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 262; Conrad, 1865, p. 17; Dall. 1890, p. 125; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 70, pl. III, fig. 8, text figure type selected, non *Papillina* Moquin-Tandon, 1855.
Turrispira Conrad, 1866, p. 19. (= [illegible])
Clavifusus Conrad, 1866, p. 19.

Genotype by subsequent designation Cossmann, 1901, *Fusus dumosus* Conrad=(*F. mississippiensis* Conrad error by Conrad, 1855, 1865). Jackson Eocene. United States.

Papillina altilis (Conrad) Plate 51, fig. 10

Fusus altilis Conrad, 1833, p. 43; Conrad; 1835, pl. 18, fig. 16; H. C. Lea, 1848, p. 100; d'Orbigny, 1850. p. 363; Harris, 1895, p. 4.
Papillina altilis Conrad, 1865, p. 17; Dall, 1890, p. 126.
Clavifusus altile Conrad, 1866, p. 19; de Gregorio, 1890, p. 84 [partim], pl. 6, fig. 24.

Fusiform, inflated, with coarse spiral striæ; shoulder of the body whorl, and base of the whorls of the spire armed with short foliated spines; body whorl with longitudinal undulations; beak broad, slightly reflected at the base.—[Conrad, 1833].

The holotype is broken. It has 7 large spines. The surface is more foliated at the base of the spines than is indicated by Conrad. The species has a shorter spire than *P. dumosa.*

Dimensions.—Greatest diameter, 37 mm., holotype (broken).

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Papillina staminea (Conrad) Plate 50, figs. 10-12

Fusus stamineus Conrad, 1833, p. 43; 1835, pl. 18, fig. 14; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363; Conrad, 1865, p. 16.
Fusus (*Clavifusus*) *stamineus* (Conrad) de Gregorio, 1890, p. 83, pl. 6, fig. 15; Cossmann, 1893, p. 37.
Fusus (*Clavifusus*) *altilis* (Conrad) de Gregorio, 1890, p. 84 [partim], pl. 6, fig. 15.
Papillina staminea (Conrad) Harris, 1896, Acad. Nat. Sci. Phila., Proc. vol. 48, p. 474, pl. 20, figs. 1-4.

Fusiform with spiral striæ of different sizes; volutions, with a single row of short tubercles with a stria passing over the summit of each; beak rather longer than the spire; reflected.—[Conrad, 1833].

Conrad's figure of this species does not show the true nature of the shell. Prof. Harris, in 1896, illustrated a series of typical representatives. The holotype is a broken shell.

The nucleus is large, round, four or five whorled, smooth and typical of *Papillina.* The whorls of the spire and body whorl are shouldered. The revolving ribs are well developed with wide interspaces. Interstitial, revolving ribs are few. Columella is medium in length.

This species is somewhat like *Levifusus irrasus* Conrad in shape and sculpture. The character of the nuclei shows the species to be distinct generically. Even a superficial examination of the nuclei would distinguish the forms. *L. irrasus* has a higher spire and has finer, revolving lines between the larger ribs.

From the character of the nucleus this species is typical *Papillina* but the character of the longitudinal nodes is different. The nodes in *staminea* are formed as in most nodose gastropods, the enlargement of rib at a particular point. In *Papillina* the surface of the shell at the apex of the node or spine is attenuated and when new material is added at the margins, the surface is pulled and puckered together around a spine. This leaves the growth lines pulled back at the shoulder in a large, curved-V formation.

Dimensions.—Height, 44 mm.; greatest diameter, 23 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Papillina papillatus (Conrad) Plate 52, figs. 3, 5, 6, 8, 9, 11

Fusus papillatus Conrad, 1833, Sept., p. 29; Conrad, 1934, App. in Morton, p. 6; Conrad, 1835, 2d ed., p. 53, pl. 18, fig. 3; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363.

Papillina papillatus Conrad, 1865, p. 17; Conrad, 1866, p. 19; de Gregorio, 1890, p. 90, pl. 6, fig. 25 under *Fusus;* Harris, 1896, Acad. Nat. Sci. Phila., Proc. vol. 48, p. 475, pl. 20, fig. 5.

Tudicla papillata (Conrad) Cossmann, 1893, p. 35; Cossmann, 1901, Essais Pal. Comp., 4 liv., p. 71, fig. *Tudicula.*

Shell fusiform, obliquely striated; beak rather long and subcylindrical; shoulder with subspurious tubercles, spire short, twisted, mammilliform. Length about 1 inch.

Locality, Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Fusiform; shoulder with thick spines; a corresponding approximate series of obsolete tubercles beneath; spire short, volutions concave, apex papillated; beak long, subcylindrical.

Locality.—Claiborne, Alab. Extremely rare.—[Conrad, 1835].

The nucleus is large, in some cases enormous for the size of the shell, many whorled, apex distinguished easily with the naked eye; the sculpture of fine, revolving lines, alternating in size; when the revolving lines are present in young and medium sized specimens they are like that of *P. dumosa* of the Jackson.

The spire in the latter is about twice the length of *papillata.* On adult specimens of *papillata* the revolving lines are usually absent, the surface being smooth except for the lines of growth, which are twisted in the region of the tubercles. The shells become large, measuring 100 and 110 mm. or more.

Perfect, large specimens are rare but collections contain a large number of broken parts of the large columella. The drawing of Prof. Harris in 1896, shows the typical adult characters.

Dimensions.—Height, 50 mm.; greatest diameter, 31 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Papillina dumosa trapaquara Harris Plate 52, figs. 2, 7, 10

Fusus (*Papillina*) *dumosus* Harris, 1892, La. Exp. Sta. Rept. upon the Hills of La., p. 29.

Clavilithes (*Papillina*) *dumosus trapaquarus* Harris, 1895, Acad. Nat. Sci. Phila., vol. 47, p. 74, pl. 8, fig. 1.

Papillina dumosus trapaquara (Harris) Vaughan, 1896, U. S. Geol. Sur., Bull. 142, p. 41.

This is a heavier, more solid form than the typical *dumosus;* it has about two more spines on the body whorl and has a smaller apex.

Localities.—Brazos River, 1 mile below Milam-Burleson County line; near McBee School-house, Cherokee Co.; Alum Bluff, Trinity River, Houston Co.; 5 miles west of Crockett, Houston Co.; Hurricane Bayou, Marster's Survey, near Crockett, Collier's Ferry, Brazos River, Burleson Co.; north of College, Crockett, Houston Co.; Dr. Collard's farm, Sparks Headright, Brazos Co. In Louisiana, near Mt. Lebanon, Bienville Parish.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

P. dumosa Conrad from the Jackson Eocene is figured (plate 52, figs. 1, 4, 12) herein for comparison.

Holotype.—Geological Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 725, 728, 730, 733, 767 and 803.

"Papillina" Cooperi (Conrad) Plate 47, fig. 3; Plate 88, figs. 3, 9

Fusus Cooperi Conrad, 1834, Acad. Nat. Sci. Phila., Jour. VII, p. 148; Conrad, 1835, pl. 18, fig. 15; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363, p. 12, non *Fusus cooperi* Gabb, 1864.

Clavifusus Cooperi Conrad, 1866, p. 19; de Gregorio, 1890, p. 84, pl. 6, fig. 20.

Melongena cooperi (Conrad) Cossmann, 1893, p. 35.

Shell fusiform, thick, ventricose; spirally striated, with very prominent longitudinal undulations which terminate above the middle of the body whorl; whorls flattened or concave above; suture of the body whorl margined by an obtuse line; beak broad, subumbilicated at the base. Length, one inch and three-fourths; breadth, nearly one inch.

Locality.—Claiborne, Alabama.

I dedicate this species with pleasure to one of our ablest naturalists, William Cooper, Esq., of New York.—[Conrad, 1834].

The nucleus of the holotype is worn. There are 4 coarse spiral ribs on the whorls of the spire beginning with the shoulder. The spiral ribs continue on the body whorl alternating with finer threads. All are crossed by 10 longitudinal nodose ribs.

The species is known only by the type. The generic classification is not certain.

Dimensions.—Height, 48 mm.; greatest diameter, 25 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Doubtful species

"Fusus" decisus Conrad

Fusus decisus Conrad, 1833, Nov., p. 43; Harris, 1895, p. 15.

Sipho (*Neptunea*) *decisus* Conrad, 1865, p. 17.

Fusus (*Neptunea*) *decisus* (Conrad) de Gregorio, 1890, p. 83.

Subfusiform, with about six convex volutions, crossed by spiral elevated striæ; spire elevated; beak extremely short, reflected; columella subumbilicated; aperture suborbicular, and with oblique rather distinct costæ.—[Conrad, 1865].

The type of this species is lost. The species was not figured. It belongs probably to the Strepsiduras.

"Fusus" explicatus Conrad

Fusus explicatus Conrad, 1833, p. 43; H. C. Lea, 1848, p. 100; Conrad, 1865, p. 16; Harris, 1895, p. 19.

Fusiform, destitute of striæ; spire short, volutions slightly concave, apex papillated; shoulder of the body whorl, with short foliated spines, which are obsolete on the spine [spire]; beak long and slightly reflected at the base.—[Conrad, 1833].

Conrad did not figure this species. Prof. Harris stated in 1895 that the type was lost. It was described from Claiborne.

"Fusus proscissus" Conrad, 1833, Nov., p. 43 was described but not figured. Harris, 1895, Bull. Amer. Pal., vol. I, No. 1, p. 37 states that the type is lost. With the exception of H. C. Lea, 1848, p. 100 who merely compiled the described and listed names, the species is not mentioned by later authors. Conrad omitted the name from his check lists of 1865 and 1866.

Short-fusiform, with spiral costæ and longitudinal undulations; summit of the whorl somewhat indented; beak short, thick, reflected; labrum with dislocated lines on the interior surface.—[Conrad, 1833].

"*Fusus ranuelloides*" Conrad, 1833, Nov., p. 43; H. C. Lea, 1848, p. 100; d'Orbigny, 1950, p. 363; Harris, 1895, p. 38 is another Conradian species apparently not rediscovered. It was never figured and the holotype has been lost.

Short-fusiform, with seven rounded volutions, spirally striated, or sulcated; whorls with two or three broad, rounded costæ, more numerous on the whorls near the apex; spire and beak nearly equal in length; body whorl ventricose; labrum crenulated within.—[Conrad, 1833].

"*Fusus*" *symmetricus* Conrad, 1834, Acad. Nat. Sci. Phila., Jour. vol. VII, p. 155; H. C. Lea, 1848, p. 100; d'Orbigny, 1850, p. 363; Harris, 1895, p. 44.

Shell fusiform; spire and beak nearly equal in length; whorls seven, rounded, with crowded very regular striæ; suture deeply impressed; two or three volutions near the apex longitudinally ribbed; labrum with a broad not much prominent varix on the exterior margin; beak slender, sinuous. Length, three-fourths of an inch.

Locality.—Claiborne, Alabama.

A beautiful species; one of the most symmetrical of the genus, and so rare that I procured but one specimen.—[Conrad, 1834].

This species was never figured and the holotype is lost.

Fusus spiniger Con. in Meyer, 1885, Amer. Jour. Sci., vol. 29, p. 468 listed in table under Claiborne. This species is Vicksburgian, described by Conrad, 1848, Acad. Nat. Sci. Phila., 2d ser. vol. 1, p. 117, pl. 11, fig. 32. The listing of this species under Claiborne age by Meyer with the corresponding equivalent "*Fusus*" *altiles* Con., the Claibornian species, under the Vicksburg heading, is probably an error in printing. The two species should be interchanged in position in the Meyer table.

Excluded species

Sipho pumila (Lea), 1833, was listed by Conrad, 1865, p. 17 from Claiborne. Such a citation was an error on Conrad's part. The shell, described by Lea, *Fusus pumilus*, 1833, p. 215 is from the Miocene, St. Mary's, Md.

Fusus nanus Lea, 1833, p. 150, pl. 6, fig. 22 is a Turrid.

Fusus venustus Lea, 1833, p. 146, pl. 5, fig. 148 is a Turrid. See Harris, G. D., Paleontographica Americana vol. II, No. 7, 1937.

Nomina Nuda

Cordieria gracilis Conrad, 1865, Amer. Jour. Conch., vol. 1, p. 23 (reference by Conrad "Proceed. A. N. Sciences, 1865" error).

"Claib."; "? *L.* (*Cordiera*) *texana* Conrad" Heilprin, 1891, pp. 395, 396="? *Cordiera gracilis* Conrad," 1886, p. 16 fide Heilprin "Ala".

There is a specimen in the Academy of Natural Sciences labelled *Cordiera texana* Conrad. It is *Latirus Moorei* (Gabb).

Fusus Claibornensis Lea, 1833, p. 19.

Family STREPTURIDÆ

Genus STREPSIDURA Swainson, 1840[555]

Genotype by original designation *Fusus ficulneus* Lam.=*S. turgida* Solander. Eocene. England, Belgium and France.

? Strepsidura ficus (Gabb) Plate 47, fig. 4

Whitneya ficus Gabb, 1864, Pal. Cal., vol. I, pp. 104, 224, pl. 28, fig. 221; Stewart, 1926, Acad. Nat. Sci. Phila., vol. 78, p. 404, pl. 29, fig. 11.

?*Strepsidura ficus* (Gabb) Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol, 47, p. 71, pl. 7, fig. 1; Aldrich, 1895, Bull. Amer. Pal., vol. I, No. 2, p. 64, pl. 3, figs. 1, 1a.

?*Bulbifusus inauratus* Heilprin, 1891, p. 396.

The specimen figured is about one-half the size of the California types and is eroded at the summit. Other specimens, though upon the whole less perfect, show the surface markings much better than the figured specimen does.

Localities.—"Ft. Téjon, Cal.," Gabb; Alum Creek Bluff, Colorado River, not far above Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Strepsidura ficus was described from the Tejon Eocene of California. Dr. Ralph B. Stewart made a valuable contribution by carefully studying Gabb's California type specimens at the Academy of Natural Sciences at Philadelphia for the reidentification of types. He did so in the light of more recent knowledge of Californian Eocene stratigraphy and in rectification of molluscan nomenclature.

Prof. Harris identified specimens from the lower Claibornian, Weches formation, near Smithville, Texas as doubtfully the same species. The Harris drawing is included herein.

Harris figured specimen.—Formerly at Geology Department, University of Texas, Austin, Texas. Probably lost.

Family VOLUTIDÆ

Genus VOLUTA Linnæus, 1758

Voluta Linnæus, 1758, Syst. Nat., ed. X, p. 729; 1766, ed. XII, p. 1186 type not designated.

Plejona (Bolten) Link, 1807, p. 110 first species *Pl. ebraea;* Dall, 1889,

[555]Swainson, Wm., 1840, pp. 90, 91, 94, 308.

Voluta Lamarck, 1799, p. 70 sole example *V. musica* L.
Plejona (Bolten) Link, 1807, p. 110 first species *Pl. ebraea;* Dall, 1899, p. 146 type designation *V. hebræa* L.; Stewart, 1926, p. 408.
Voluta Montfort, 1810, p. 551, type designation *V. musica* L.
Volutolyria Crosse, 1877, Jour. de Conch., vol. 25, p. 99 *Voluta musica* L.
Voluta (Lamarck) Dall, 1907, p. 143 type *V. musica* L.

Genotype by subsequent designation, Montfort, 1810, *V. musica* Linnæus. Living. West Indies and coast of Venezuela.

Genus **VOLUTILITHES** Swainson, 1831

Volutilithes Swainson, 1831, Zool. Illust., vol. II, 2d ser., pl. 53, expl. type designation "Type, Voluta musicalis ? Lam."; nec Swainson, 1840; nec Dall, 1890; nec Cossmann, 1899.
Volutilithes Dall, 1906, Nautilus, April, vol. 19, No. 12, p. 143 type designation *V. muricina* Lam.; Newton, 1906, Proc. Mal. Soc. Lond., vol. VII, No. 2, p. 103, type designation *V. muricina* Lam. Reproduction of Swainson's description and plate.
Eosephæa Fischer, 1883, p. 607 type *V. muricina* Lam.

Genotype by subsequent designation, Dall, 1906, *Voluta muricina* Lam. Eocene. France and England.

The complications involved in *Volutilithes* Swainson were relieved when Dall and Newton revived the original description of *Volutilithes* from Swainson's work in 1831. *Volutilithes* had been commonly interpreted as used by Swainson in 1840, with *Conus spinosus* Linn. as type. Newton, in 1906, loc. cit., revealed that *Volutilithes* Swainson, 1831, and Swainson 1840 were distinct. He proposed *Volutospina* to replace *Volutilithes* Swainson, 1840. Further discussion of that question is given under *Athleta*.

As Newton explained, Swainson in 1831, was in doubt as to what would be the definite type of the genus *Volutilithes*. Swainson stated, under generic characters "Type, Voluta musicalis? Lam." In the general discussion he stated "The pre-eminent type may probably be the *V. musicalis,* of Lamarck; as yet, we only know this fossil from descriptions and figures, but it has obviously been confounded with several others." Swainson also in the same paragraph, used the word "type" to imply different shades of meaning.

Such an indefinite statement of type would seem to fall under Int. Rules Zool. Nom., Art. 30, II (e) *β*, "*species inquirendae* from the standpoint of the author of the generic name at the time of its publication". It would therefore be "excluded from consideration" as type.

Dall's and Newton designaiton of *V. muricina* Lam., one of the other two species mentioned in the original description, would hold.

The result of this discussion is the same as that given by Newton in 1906 but the process of reasoning is different.

Newton deducted that since the type mentioned doubtfully by Swainson was too closely related generically to *Voluta musica,* type of *Voluta,* it could not be used by Swainson. Such is not the initial issue. The first point to be settled is whether Swainson's type designation is valid. If it is a valid designation, *V. musicalis* Lam. becomes type of the genus *Volutilithes* Swainson, 1831 non 1840. *V. musicalis* not being distinct generically from *Voluta, Volutilithes* becomes synonymous with *Voluta.*

If Swainson's designation is not valid then the subsequent designation of *V. muricina* stands for the genus.

Genus **ATHLETA** Conrad, 1853

Athleta Conrad, 1853, Acad. Nat. Sci. Phila., Proc. vol. VI, p. 449 type not designated; Conrad, 1854, ibid, vol. VII, p. 31; Dall, 1890, p. 75 type designation *V. rarispina* Lam.; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 140; Cossmann, 1906, Revue Crit., p. 222; Smith, 1907, Acad. Nat. Sci. Phila., Proc. vol. 59, p. 229; Smith, 1907, Nautilus, vol. 20, No. 11, p. 131; Cossmann, 1909, Essais Pal. Comp., 8 liv., p. 209.

Volutilithes Swainson, 1840, p. 318; non Swainson, 1831.

Plejona Dall, 1906, Nautilus, April, vol. 19, p. 143 *V. spinosa* not definite designation of type; Dall, 1907, Smith. Misc. Coll., vol. 48, p. 354; Dall, 1907, Nautilus, vol. 20, No. 11, p. 142; non *Plejona* "Bolten" Roeding, 1798.

Volutospina Newton, 1906, ibid, p. 103 substitute for *Volutilithes* Swainson, 1840.

Genotype by subsequent designation, Dall, 1890, *Voluta rarispina* Lam.=*Athleta ficulina rarispina* Lam. Miocene. Europe.

The problem of the generic naming of the Claibornian Eocene Volutes will probably not be settled for sometime because of the indefinite relationship of *Athleta ficulina rarispiana* (Lamarck) of the Miocene of Europe. The American species such as *A. sayana* (Conrad) and *A. petrosa* (Conrad) are of the group of *A. spinosa* (Linnæus) of the French Eocene. This is the species which Dr. Dall in 1906 partially suggested as the type of *Plejona* Bolten. The statement which he made was not definite enough to satisfy the rules of nomenclature. Dall continued to use the name *Plejona* while others used *Volutospina* for shells typified by *Conus spinosus* Linn. *Volutospina* was created by R. Newton in 1906. Dall's use of *Conus spinosus* L. was based, although he did not state so in words, on the selection of the synonymous *Plejona fossilis* the first of twenty-four species which Bolten mentioned under *Plejona*. *Plejona fossilis* is referred to d'Argenville, Hist. Nat. Lithol. Conch. pl. 33, fig. 10, 1742. Fig. 10 of that reference consists of four different species of four different genera[556]. One appears to be *Conus spinosus* which Dall used as type of *Plejona* although he did not state concisely the particular process of so choosing.

Stewart[557] has settled that problem by definitely choosing the lectotype of *P. fossilis*, "third figure from the left" in the figures of fig. 10, which is probably synonymous with *Conus spinosus*. As to the type of *Plejona* (Bolten) Link, Dall designated *V. hebræa* L. in 1889. See also Stewart under the same reference as mentioned.

Since *Plejona* Bolten falls in synonymy with *Voluta, Volutospina* Newton has been used to cover the species of the *petrosus-spinosus* group. There is a name however, which cannot be ignored. Conrad, in 1853, gave the name of *Athleta* to three species of Volutes. The first one mentioned, *A. rarispina*, Dall designated as the type. The third species which Conrad mentioned was *A. tuomeyi* which is not a species but a pathologic development of *A. petrosa*.

A. rarispina Lamarck is considered by Prof. A. Peyrot of Bordeaux, France, as a variety of *A. ficulina*. Prof. Peyrot generously sent several figures of *A. ficulina* and varieties. Those illustrations are included herein, plate 57, figs. 3, 5-9.

The characters of *A. rarispina* in the young stage are like those of *petrosus-spinosus*. Hence *Athleta* would be used in place of *Volutospina*. This is the procedure suggested by Cossmann[558] and followed by Smith[559].

Rarispina was an unfortunate choice as type of the genus *Athleta* because the species or variety does not represent normal development but may be regarded as a gerontic stage. With the exception of the *tuomeyi*, abnormal stage of *A. petrosa*, none

[556]Newton, R. Bullen, Proc. Mal. Soc. Lond., vol. VII, p. 104, 1906.
[557]Stewart, Ralph, 1926, p. 408.
[558]Cossmann, M., Revue Critique de Paléozoologie, p. 222, Oct. 1906.
[559]Smith, B., Acad. Nat. Sci. Phila., Proc. vol. 59, p. 229, 1907.

of the numerous species as the stock developed in the American Claibornian Eocene shows a senile development as that of *A. rarispina.* However, when the young and normal growths of the species are observed, the characters of the European and American forms are similar.

For those to whom the grouping of the Claibornian species under *Athleta* seems to be too general, the subgenus *Volutospina* Newton is available. For definite naming of the relationships the group needs individual attention.

Athleta petrosa (Conrad) Plate 58, figs. 1-14; Plate 88, figs. 1, 7, 11

Voluta petrosa Conrad, 1833, Aug., p. 29; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 41. pl. 16, fig. 2; H. C. Lea, 1848, p. 107; d'Orbigny, 1850, p. 353; de Gregorio, 1890, p. 63, pl. 4, figs. 50, 51, 53, 59, 60.

Volutilithes petrosa Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 31; Conrad, 1865, p. 23; Conrad, 1866, p. 16; Dall, 1890, p. 76; Heilprin, 1891, p. 396; Cossmann, 1893. p. 39; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 33, pl. 4, fig. 1 extended synonymy; Smith, 1906, Proc. Acad. Nat. Sci., Phila. vol. 58, p. 58, pl. II, figs. 3-10; Aldrich, 1931, Geol. Sur. Ala., Museum Paper 12, p. 6, pl. 6, fig. 3.

Voluta parva Lea, 1833, Dec., p. 173, pl. 6, fig. 181; H. C. Lea, 1848, p. 107.

Voluta Vanuxemi Lea, 1833, Dec., p. 173, pl. 6, fig. 182; H. C. Lea, 1848, p. 107.

Athleta tuomeyi Conrad, 1853, Acad. Nat. Sci. Phila., vol. VI, p. 449; Conrad, 1860, ibid, 2d ser. Jour., vol. IV, pl. 47, fig. 35; Conrad, 1865, p. 24; Conrad, 1866, p. 16; Dall, 1890, p. 75 under *V. petrosus;* Clark, 1896, U. S. G. Sur., Bull., No. 141, p. 65, pl. X, figs. 1a, 1b; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 141, pl. 5, fig. 5.

Volutalithes symmetrica Conrad, 1954, in Wailes Agr. and Geol. of Miss., pl. XV, fig. 6; Conrad, 1865, p. 24.

Volutalithes dumosa Conrad, 1854, l. c., pl. 16, fig. 1; Conrad, 1865, p. 23.

Volutilithes indenta Conrad, 1865, pp. 23, 144, pl. 21, fig. 10. Label at the A. N. S. of the type specimen reads "Texas?" variety.

Volutilithes impressa Conrad. 1865, pp. 23, 144, pl. 20, fig. 3 Texas.

Athleta petrosa Smith, 1907, Acad. Nat. Sci. Phila., Proc. vol. 59, p. 229.

Volutocorbis (*Volutospina*) *petrosus* Stewart, 1926, Acad. Nat. Sci. Phila., Proc. vol. 78, p. 407.

Shell subglabrous; body whorl marked with from eight to ten longitudinal folds, terminating on the shoulder in compressed subacute tubercles, which are also distinct on the spire; transversely striated at base; two folds on the columella. Length 1½ inches.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Subglabrous; coronated; with 8 to 10 longitudinal folds; spire turrited; base striated; columella with two plaits.

Syn. V. vanuxemi, *Lea. Con. p.* 173, *pl.* 6, *f.* 182.

Locality.—Claiborne, Alab.

Allied to *V. spinosa.* Not. abundant. No. 3, first ed. p. 29.—[Conrad, 1835].

The range of this species is from the Sabine through the Jackson Eocene, widely distributed in the southern Eocene embayment. Consequently numerous names have been given to it. The first name to be applied is that of *petrosa* by Conrad from the "sand" at Claiborne Bluff. *A. petrosa* in typical form appeared in the Sabine Eocene. Smith[560] working on the phylogeny of the species determined *A.* (*Volutocorbis*) *limopsis* Conrad of the Midway Eocene as the ancentral form.

The young form of the species in the Sabine has the surface with sub-cancellated sculpture, the spiral lines slightly predominating over the longitudinal lines. The sculpture covers the whole surface of the shell. The shoulder of the whorls has spiny nodes, delicate on the whorls of the spire. Some specimens retain the sculpture of the young in the adult stages but the common development is for the spiral and longitudinal lines to become obsolete on the upper part of the body whorl and the nodes to become more spinose. Fewer nodes are developed. This is the line of development which occurs in the lower and upper Claiborne and Jackson stages most commonly with slight variations due to local conditions.

The conspicuous feature of the species is the abnormal development of the callus. The adult animal secretes an excess of callus which spreads over the upper part of the ventral part of the body whorl and back over the penultimate whorl and higher whorls of the spire. The callosity is wholly a surface feature and does not alter the established characters of the shell except that it covers the surface. The form before it secretes the extra callus is of the common spinose shell with the upper part of the body whorl smooth. Some specimens develop an irregular, narrow, crenulated, longitudinal area on the interior of the outer lip. Conrad, not recognizing the relationship of the abnormal with the normal, called the unnatural shells *Athleta tuomeyi.* The shells develop the callus character at Bell's Landing, Gregg's Landing, Hatchetigbee and Woods Bluff, Ala. Specimens in the U. S. Nat. Mus., No. 111875, are *A. tuomeyi* from the Gosport sand, Claiborne, Ala. The callus is not excessive.

[560]Smith, Burnet, Acad. Nat. Sci. Phila., Proc. vol. 58, p. 57, 1906.

No. 111874 from 2 miles south of Meridan, Miss. lower Claiborne Eocene is typical *A. tuomeyi*. One specimen, No. 111902, among several normal forms, from Jackson, Miss., Jackson Eocene has the callus above the columella over the posterior part of the body whorl.

The type of *petrosa* was described from the Gosport sand at Claiborne, Ala. For typical details the shell is further described from there.

The nucleus consists of four, smooth whorls, elevated and distinct. On the fourth whorl well-marked, curved longitudinal ribs occur followed soon by a shoulder below the suture and two rows of tubercles below the suture. Dr. Burnett Smith[561], in his fine papers on the phylogeny of the race has taken up the details of whorl development in the different phases of *petrosa* ontogeny. Reference is made to Dr. Smith's papers and a duplication of those details will not be given in this discussion.

Young specimens 7 or 8 mm. in height from the Gosport sand have the longitudinal ridges developed the full length of the whorls of the spire and about half the length of the body whorl. The number of longitudinal folds varies from 8-13 on the body whorl of the adults. The number of columellar plications is not limited to two. Two plications are commonly developed but three as well as several irregular, smaller plications may be common.

At Hickory, Miss., lower Claiborne, the form is short and stubby. The Hickory collection exhibits two types of youth. A larger number of the young specimens have the spiral lines developed over the whole of the surface of the whorls. Other specimens of the same size have the adult growth accelerated and the upper part of the body whorl is smooth. The nodes on the shoulder whorls are slightly more spinose and the spire slightly longer. There are gradations between the two types so that one may be sure that they are both the young of the same species.

A variation occurs at Moseley's Ferry, Texas. It is a form with the nucleus consisting of three smooth whorls, the fourth

[561]Smith, Burnett, Acad. Nat. Sci. Phila., Proc. vol. 58, pp. 52-76, 1906; l. c. vol. 59, pp. 229-242, 1907.

whorl represents the curved rib stage. The collection includes mostly small specimens. The character which seems to make its appearance different from typical is subdued spines and transverse ribs about equal to longitudinal ribs in strength. This variation has been noted at other localities by authors. It is believed to be the same as the *Volutilithes indenta* Conrad, 1865. Since the name has been given in literature it is retained as *Athleta petrosa indenta.* Conrad's figure shows fewer longitudinal ribs than specimens which have been found that are alike in other respects. The type of *A. indenta* was not found. The young of both *petrosa* and *indenta* show the same differences as the adult, however specimens occur at the same locality where typical *petrosa* and *indenta* occur which exhibit characters of each. A specimen of such is figured, plate 58, fig. 6. The sharp spines are typical of *pterosa* while the spiral lines over the body whorl are like *indenta.* On the specimen figured, the spiral lines are becoming obsolete.

The Jackson shells retain commonly the spiral lines over the whole of the surface of the whorls in the adult stage. Many specimens become smooth on the upper part of the body whorl as is characteristic of the species in the Sabine and mid-Eocene.

Dimensions.—Height, 48 mm.; greatest diameter, 24 mm., lectotype. Height, 8 mm.; greatest diameter, 4 mm., lectotype *V. parva* Lea. Height, 32 mm., greatest diameter, 19 mm., lectotype *V. Vanuxemi* Lea. Height, 36 mm.; greatest diameter, 19 mm., type *A. tuomeyi* Conrad.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; *A. tuomeyi* Conrad, A. N. S. No. 5883, A. N. S. lectotype *V. parva* Lea. No. 5884, A. N. S. lectotype *V. Vanuxemi* Lea. Types of *V. indenta* and *V. impressa* Conrad, supposedly at the A. N. S. were not found in 1936.

Occurrence.—Sabine Eocene: common. Lower Claiborne: localities 707, 708, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732. 733, 734, 741, 743, 766, 767, 803 and 832. Gosport sand: locality 104 (type). Jackson Eocene.

Athleta sayana (Conrad) Plate 60, figs. 1-10; Plate 88, fig. 6

Voluta sayana Conrad, 1833, Sept., p. 29; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 41, pl. 16, fig. 1; H. C. Lea, 1848, p. 107; d'Orbigny, 1850, p. 353; Harris, 1895, p. 40.

Voluta Defrancii Lea, 1833, p. 171, pl. 6, fig. 179, [yg.]; H. C. Lea, 1848, p. 107; de Gregorio, 1890, p. 63, pl. IV, figs. 52, 61; Harris, 1895, p. 15.

Voluta gracilis Lea, 1833, p. 172, pl. 6, fig. 180; H. C. Lea, 1848, p. 107; Harris, 1895, p. 21.

Volutilithes sayana Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 31; Conrad, 1865, p. 24; Conrad, 1866, p. 16; non Conrad, 1857, U. S. and Mex. Bdy. Sur., 162, pl. XIX, fig. 6.

Voluta Sayana (Conrad) de Gregorio, 1890, p. 64, pl. 5, figs. 1-5 vars. *ipnotica* and *mica*.

? *Voluta petrosa gracilis* de Gregorio, 1890, p. 64, pl. IV, figs. 54-56.

? *Voluta teplica* de Gregorio, 1890, p. 65, pl. 5, fig. 7.

? *Voluta petrosa mitis* de Gregorio, 1890, p. 64, pl. 4, figs. 57-58.

Volutilithes sayana Dall, 1890, pp. 69, 75; Whitfield, 1892, U. S. Geol. Sur., Mon. 18, p. 212, pl. 30, figs. 11-15.

Volutilithes sayanus (Conrad) Heilprin, 1891, p. 397; Cossmann, 1893, p. 39; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 137; Smith, 1906, Acad. Nat. Sci. Phila., Proc. vol. 58, p. 66, figs.

Athleta sayanus (Conrad) Smith, 1907, ibid, vol. 59, p. 238 figures.

Shell ventricose, with numerous distinct longitudinal striæ; body whorl, with about fourteen longitudinal undulations, having two or three small tubercles on the shoulder of each; transverse striæ numerous, more profound near the base; spire acute, tuberculated, elevated; four folds on the columella, one of them obsolete. Length 2½ inches.

Locality.—Claiborne, Alab.

Bears a general resemblance to *V. luctator*, Sowerby.

Cab. Acad. N. S.

I dedicate this species to my distinguished friend, Mr. T. Say.—[Conrad, 1833].

Ventricose, with numerous distinct longitudinal striæ; body volution profoundly undulated above, the ridges tuberculated by the intersection of coarse spiral lines; lines less distinct in the middle and profound near the base; columella 4-plaited, the superior one obsolete; labium striated within.

Syn. V. gracilis, V. defrancii, V. parva, *Lea. Con. P.* 171.

Locality.—Claiborne, Alab.

A common species, allied to *V. luctator*. The plaits vary in number; one specimen is profoundly cancellated, and has a depressed spire. The species is dedicated to Say, the lamented naturalist. No. 3, first ed. p. 29.—[Conrad, 1835].

This species is the most abundant *Athleta* in the Gosport sand. There is considerable variation in the character of the sculpture. Conrad's collection of type specimens includes specimens which exhibit a series of variations. Some large specimens have a strong cancellated surface, the result of the equal development of the longitudinal and transverse lines. More often the specimens have the longitudinal lines predominate over the transverse. One of Conrad's type specimens was drawn by Meyer and is selected as the lectotype. This seems to be the specimen which Conrad figured in 1835. Some specimens have the transverse lines only on the basal portion of the body whorl and the longitudinal lines are not developed regularly over the upper portion of the body whorl. On all of the specimens a smooth area occurs on the posterior ventral side of the body whorl just above the columella. The number of plications on the inner lip vary from two to five or six. Three is the average number. If there are more than three they are usually smaller in size and alternate with the major folds. Lea's *V. gracilis* and *V. Defrancii* are immature *A. sayana.* De Gregorio seemed to be unable to distinguish the individual development series. He made the young forms as named by Lea, varieties of *A. petrosa* Conrad. De Gregorio's figure 52 of plate 4 of his Claiborne monograph is the young of *A. petrosa* and is not *V. Defrancii* Lea.

The nucleus consists of one and a half, smooth whorls horizontally coiled.

The nodes at the shoulder of the whorls are more tuberculated in the adult than in the young stages. The number of longitudinal ridges and tubercles varies from twelve to fourteen and more. Fourteen is about the average number.

The young shells of this species differ from the young forms of *A. petrosa* in having the shoulder nodes much less spinose and the longitudinal ridges are developed less. Further differences between the two are discussed under *A. petrosa.* Dr. Smith has shown clearly the differences between the two species and workers are referred to his papers.

There does seem to be a variation of *A. sayana* which De Gregorio apparently separated from typical *A. sayana.* The author believes De Gregorio had the same form in his *mica* and *ipnotica.* In *ipnotica* the spiral lines cover the whole of the body whorl while in *mica* the upper half of the body whorl is smooth. Such varietal differences from *sayana* are not worthy of distinct names. But since careful discrimination does group the forms in sets with these variations as noted and since De Gregorio has introduced the names, those names are used to indicate such variations. The first name *mica* is selected to stand for the variety. This form has a smaller, slightly shorter spire. Whorls of the spire are not so sharply shouldered. The conspicuous character of the surface is the regular development of the transverse lines to the exclusion of the longitudinal lines. The absence of the longitudinal lines is constant on fairly young specimens. Some specimens show longitudinal folding on the young. On the adults there may also be an absence of transverse lines over the upper part of the body whorl and spire. It is this condition that De Gregorio figured as *mica*, fig. 3-4, pl. 5 of his monograph.

This species is not related to *A. luctator* (Solander)[562] of the English and French Bartonian as Conrad pointed out although the young of that species is somewhat similar, it is more of the type of *A. ambigua* (Solander) of the same Eocene stage, as Cossmann showed in 1893. It is specifically distinct from *A. ambigua*. The spire is more elevated and the nodes on the shoulder of the body whorl, which in *A. sayana* are limited to that area, in *A. ambigua* are the tip of longitudinal ridges which extend down two-thirds at least of the length of the body whorl.

Dimensions.—Height, 55 mm.; greatest diameter, 29 mm., lectotype. Height, 15 mm.; greatest diameter, 7 mm.; lectotype *V. gracilis* Lea. Height, 21 mm.; greatest diameter, 10 mm., lectotype *V. Defrancii* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5882, A. N. S. lectotype *V. gracilis* Lea No. 5879, A. N. S. lectotype *V. Defrancii* Lea.

Occurrence.—Gosport sand: locality 104.

Athleta clayi Smith Plate 61, figs. 2-4

Athleta clayi Smith, 1907, Acad. Nat. Sci. Phila., Proc. vol. 59, p. 234 text figures.

Locality.—St. Maurice, Louisiana.

Horizon.—Lower Claiborne.

The more important morphological features of this species may be summed up as follows:

Whorl 1.—Smooth and rounded.

Whorl 2.—Smooth and rounded at first, but soon a very few untubercled but nearly straight ribs appear. These probably represent a somewhat suppressed and condensed curved rib stage. They are followed by the straight tubercled ribs of the cancellated stage. At first the suture tubercle is larger, but a shoulder angle soon forms and the shoulder tubercle becomes dominant.

Whorls 3, 4.—Characterized by the cancellated stage. Much as in the latter part of whorl 2, but the ribbing above the shoulder grows weaker.

Whorls 5, 6.—Characterized by the cancellated stage, but toward the end of 6 the ribbing above the shoulder is gone and the suture tubercles are weak. The shoulder tubercle strengthens and the ribbing below it is well developed. Whorls covered with fine spirals from the shoulder down-

[562] Solander, D. C., in Brander, G., Fossilia Hautoniensia, p. 30, pl. V, figs. 64, 67, 1766; Solander, D. C., ibid, p. 32, pl. V, fig. 69 *Strombus ambiguus*, 1766.

ward, but they are stronger below on the branchial siphon.

Whorl 7.—Still characterized by the cancellated stage. The suture tubercle and the spirals immediately below the shoulder both disappear. The spirals are well developed, however, on the branchial siphon. Toward the end of the whorl the ribbing below the shoulder disappears and the shoulder tubercles become spine-like, so that the cancellated stage ends with the close of whorl 7.

Whorl 8.—Characterized by the spiny stage. Shoulder spines sharp. Spirals on the branchial siphon only. Shelly smoothing of the preceding whorl is slight.

Remarks.—This form is distinguished from the St. Maurice race of *Athleta petrosa* by its large and swollen apex; by its smooth stage which occupies little more than one whorl; by its more or less suppressed curved rib stage, and by the earlier decline of the spirals immediately below the shoulder. The following table will serve to compare *Athleta petrosa,* and also with a probable descendant, *Athleta sayana,* of Claiborne, Alabama.—[Smith, 1907].

Dimensions.—Height, 27.5 mm., 12 mm.; greatest diameter, 14 mm., 5 mm., respectively syntypes.

Syntypes.—No. 6760, Academy of Natural Sciences, Philadelphia, Pa.

Athleta haleanus (Whitfield) Plate 61, figs. 5-8

Mitra haleanus Whitfield, 1865, Amer. Jour. Conch., vol. I, p. 263, pl. 27, fig. 6; Aldrich, 1887, Cincinnati Soc. Nat. Hist. Jour., vol. X, No. 2, p. 80.

Volutilithes haleanus Smith, 1906, Acad. Nat. Sci. Phila., Proc. vol. 58, p. 69.

Shell broadly-fusiform; spire moderately high, broadly conical, pointed; body whorl ventricose, somewhat angular, and with a strongly concave space in the upper part; suture bordered below by an elevated nodose ridge; columella produced below, marked near its middle by three somewhat oblique equidistant folds; surface marked by numerous small, longitudinal folds, which form nodes on the angular part of the volutions, and become obsolete just below the middle; the entire surface is marked by slightly alternating revolving grooves, which cut the folds, and give to the upper part of the volution a strongly cancellated or rasp-like appearance; most specimens have an intermediate revolving line in the concave part of the volution.

Locality.—Vicksburg, Miss.—[Whitfield, 1865].

The nucleus consists of two and a half whorls.

Dr. Burnett Smith described the ontogeny of this species in detail.

This is a distinctive species of the lower Claiborne.

Aldrich pointed out the fact that the type specimen contained Lisbon sand and was not from Vicksburg. The species is one of the common forms at Lisbon, Ala. and at the base of the bluff at Claiborne, Ala. in the lower Claiborne horizon along the rivers edge just below Claiborne toll bridge on the Alabama River.

One specimen in the Paleontological Research Institution collection measures 50 mm. in height and 22 mm., greatest diameter.

Through the courtesy of A. W. Slocum, Walker Museum University of Chicago, the figures and measurements of the holotype are given.

Dimensions.—Height, 22.4 mm.; width, 9.5 mm. —11.1 mm. (right angles and parallel to the aperture).

Holotype.—Cat. Nos. Whit. 1184, U. C. 24672, Walker Museum of Paleontology, The University of Chicago.

Occurrence.—Lower Claiborne: localities 103, 734 and 778.

Athleta wheelockensis (Cossmann) Plate 59, figs. 6, 7, 12

Volutilithes precursor Dall, 1890, Aug. p. 84, pl. 6, fig. 1; Heilprin, 1891, p. 397; Smith, 1907, Acad. Nat. Sci. Phila., Proc. vol. 59, p. 230; non V. *praecursor* Bellardi (Sacco), 1890, [Jan. fide Cossmann, 1899, p. 140].

Volutilithes wheelockensis Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 137 new name.

Shell subfusiform, six-whorled; nucleus small, spiral sculpture of the usual threads near the canal anteriorly, fading away toward the periphery and appearing again on and behind the shoulder; transverse sculpture of twelve or more rather rounded, not much elevated ribs, which, on the last whorl of the adult, are a little sharper by having a long anterior and a short posterior slope, which gives them a sort of flattened appearance; they pass clear over the shell and are sharpest at the periphery, while in most species of this group in American rocks the ribs are most prominent on the shoulder and become obsolete on the body; suture appressed, the whorl in front a little constricted, with a tendency to small, prickly points at tne shoulder, aperture narrow, outer lip simple, thickened at the ribs, but not varicose, strongly lirate within; inner lip with a wash of callus anteriorly and two well-marked, subequal, clearcut, distant plaits; canal a little constricted, nearly straight, deeply notched, forming a fasciole. Max. lon. of shell 28.0; of aperture 20.0; max. diam. 13.0 mm. A fragment indicates a length of aperture sometimes attained of 34.0 mm., corresponding to a shell 47.6 mm. in length.

The specimens are of Eocene age, the locality half a mile east from Wheelock, Texas.

This shell has been figured as showing the tendency toward the surface-characters of *Lyria* and the slight conchological gap separating these forms. Its nearest relative is *V. rugatus* Conrad, which is found in the same stratum, and from which its sculpture distinguishes it with sufficient clearness. It will be observed that the plaits are not crowded by callus as is commonly the case in this genus, and I may add that, in one specimen, a feeble third plait lags behind the others within the shell.—[Dall, 1890].

The statement of Dall that *V. rugatus* Conrad and this species occur in the same strata is a mistake for *V. rugatus* does not occur above the Midway Eocene.

Plummer named varieties of this species and *lisbonensis* from the lower Claiborne formations of Texas. One wonders of how much value are numerous names to variants of an unstable species. More names could be applied for further slight variations from the typical. Smith, in his papers on the races of *A. petrosa* has shown excellently the variations that may be expected in the stock. Table I, Smith 1907, p. 233, particularly revealed one variable character in specimens from ten localities.

A. wheelockensis is related to *petrosa*. A tendency toward *A. wheelockensis* is seen in such specimens as Aldrich figured as *A. lisbonensis*. One can find specimens which for the spiral striæ below the suture grade from *wheelockensis* to *petrosus*.

The relationship of *lisbonensis-petrosus* and *wheelockensis* is shown by the series of specimens which Plummer has named varieties of *lisbonensis* and varieties of *wheelockensis*. The similarity of character may be traced through the series.

This species occurs abundantly in a lower Claiborne Louisiana locality, the exact location notes of which are lost. The specimens however give the characters of the species.

Dimensions.—Height, 23 mm.; greatest diameter, 10 mm.

Holotype.—No. 111865, United States National Museum, Washington, D. C.

Occurrence.—Lower Claiborne: one-half mile east from Wheelock, Texas (Dall).

Athleta wheelockensis bastropensis (Plummer) Plate 59, figs. 3, 4, 8

Plejona (*Volutocorbis*) *wheelockensis bastropensis* Plummer, 1933, Univ. Texas, Bull., No. 3232, p. 813, pl. IX, fig. 16.

First 3 whorls smooth, 4th and 5th ribbed, others cancellate; 16 longitudinal ribs on whorl next to last; 4 or 5 transverse ribs on last whorl; transverse ribs much larger than longitudinal ribs; apical angle 55°; altitude, 26 mm.; maximum diameter, 11 mm.—[Plummer, 1933].

Holotype.—Bureau of Economic Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Weches formation, Colorado River, just north of bridge, Smithville, Bastrop County, Texas. (Plummer); Crockett formation: ? locality 723.

Athleta wheelockensis sabinensis (Plummer) Plate 59, figs. 10, 13

Plejona (*Volutocorbis*) *wheelockensis sabinensis* Plummer, 1933, Univ.

Texas, Bull., No. 3232, p. 813, pl. IX, figs. 20, 21.

First 3 whorls smooth, 4th and 5th ribbed, others cancellate; 13 longitudinal ribs on next to last whorl; 4 transverse ribs on last whorl; transverse ribs much larger than longitudinal ribs; apical angle 61°-63°; altitude, 24 mm.; maximum diameter 11 mm.—[Plummer, 1933].

Holoytpe.—Bureau of Economic Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Crockett formation, two miles west of Columbus, Louisiana, on Texas side of Sabine River. (Plummer); locality 840.

Athleta dalli Harris Plate 61, figs. 11-14

Caricella reticulata Heilprin, 1891, p. 396 non Aldrich, 1865 fide Harris, 1895.

Volutilithes dalli Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 67, pl. 6, figs. 8, a; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 137; Smith, 1907, Acad. Nat. Sci. Phila., Proc. vol. 59, p. 230.

Size and general form as indicated by the figures; whorls about 7; spiral whorls and shoulder of the body whorl generally coarsely cancellated with revolving lines and transverse costæ; humeral angle of the body whorl often spinose; medial portion of the body whorl with finer but very distinct revolving striæ and fine lines of growth; base of body whorl as in other members of this genus; labrum strongly lirate within; columella with two well-defined oblique plaits and sometimes one or more rudimentary ones.

The amount of reticulation or ornamentation possessed by different individuals of this species varies greatly. Some specimens are quite smooth on the medial portion of the body whorl, and show but slight irregularities on the shoulder. A form of this character is shown in fig. 8a. Such specimens have usually two well-marked folds on the columella and no trace of additional ones.

This species is evidently related to *V. haleanus* Whitfd., but is less strongly sculptured, and wants the peculiar concave humeral zone of that species. Moreover, *haleanus* has three distinct and well-defined columellar plaits.

This species is named in honor of W. H. Dall, the wellknown authority on *Volutidæ*.

Localities.—Smithville; Cedar Creek, Robertson Co., Tex.

Horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The young of this species has the longitudinal, short ridges present. These become obsolete on the body and penultimate whorls but may be seen on the superior whorls of the spire in old age. The nucleus consists of three and one-half whorls as in the Claiborne specimens of *A. petrosa.* The adult sculpture may suggest that of *Volutocorbis limopsis* (Conrad), type of *Volutocorbis* Dall[563], but the early apical whorls approach nearer

[563]Dall, W. H., 1890, p. 75. Genotype by original designation. Midway Eocene. Alabama to Texas.

Athleta.

Species such as *dalli* and *wheelockensis* with their variants have diverged from typical *Athleta* but just what subgeneric name will cover such development is beyond the scope of the present work. *Volutocorbis* represents the origin of the stock but hardly includes the abundant expansion in the lower Clai-bornian.

Dimensions.—Height, 32 mm., canal broken; greatest diameter, 17 mm.

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Smithville, Bastrop County, and Cedar Creek, Robertson County, Texas.

Athleta dalli smithvillensis (Plummer) Plate 61, figs. 9, 10

Athleta (*Volutocorbis*) *dalli smithvillensis* Plummer, 1932, Univ. Texas Bull., No. 3232, p. 813, pl. IX, figs. 14, 15.

First 4 whorls smooth, 5th and 6th ribbed; transverse lines nearly as prominent as longitudinal ribs; 28+ —40—50 longitudinal ribs on the next to last whorl; 3-5 transverse ribs on last whorl; apical angle 59° - 65°; altitude 21-31 mm.; maximum diameter, 11-14 mm.—[Plummer, 1933].

Holotype.—Bureau of Economic Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Weches formation, Colorado River, just north of bridge, Smithville, Bastrop County, Texas. (Plummer); locality 768.

Athleta lisbonensis (Aldrich) Plate 59, figs. 14, 15

Volutilithes lisbonensis Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 14, pl. 2, figs. 1, 1a.

Dimensions.—Height, 38 mm.; greatest diameter, 19 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Lisbon, Alabama (Aldrich).

Athleta lisbonensis crockettensis (Plummer) Plate 59, fig. 11

Plejona (*Volutocorbis*) *lisbonensis crockettensis* Plummer, 1933, Univ. Texas Bull. No. 3232, p. 813, pl. IX, fig. 19.

First 4 whorls smooth, 5th and 6th ribbed; transverse ribs much larger than longitudinal ribs: 20 longitudinal ribs on whorl next to last; 5 transverse ribs on last whorls; apical angle 71°; altitude, 30 mm.; maximum diameter, 14.5 mm.—[Plummer, 1933].

Holotype.—Bureau of Economic Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Crocket formation, Moseley's Ferry, Burleson County, Texas. (Plummer) ; locality 723.

Athleta lisbonensis wechesensis (Plummer) Plate 59, figs. 5, 9

Plejona (*Volutocorbis*) *lisbonensis wechesensis* Plummer, 1933, Univ. Texas, Bull. No. 3232, p. 813, pl. IX, figs. 17, 18.

First 4 whorls smooth, 5th and 6th ribbed; 18 longitudinal ribs on whorl next to last; 4 transverse ribs on last whorl; transverse ribs much larger than longitudinal ribs; apical angle 61°; altitude, 21 mm.; maximum diameter, 10 mm.—[Plummer, 1933].

Holotype.—Bureau of Economic Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Weches formaiton, bank of Colorado River, just north of bridge, Smithville, Bastrop County, Texas (Plummer).

Genus **VOLUTOCORBIS** Dall, 1890[564]

Genotype by original designation, *V.* (*Volutilithes*) *limopsis* (Conrad). Midway Eocene. Southern United States.

Volutocorbis stenzeli (Plummer) Plate 59, figs. 1, 2

Plejona (*Volutocorbis*) *stenzeli* Plummer, 1932, Univ. Texas, Bull. No. 3232, p. 813, pl. IX, figs. 12, 13.

First 3 whorls smooth, 4th and 5th ribbed, others cancellate; 40 longitudinal ribs on next to last whorl; 4 transverse ribs on the body whorl; transverse ribs about equal in height to longitudinal ribs; apical angle 64°; altitude 20 mm.; maximum diameter, 10 mm.—[Plummer, 1933].

Holotype.—Bureau of Economic Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Reklaw formation, from dump at side of old copper prospect 4½ miles northeast of Harwood, Caldwell County, Texas (Plummer).

Genus **LAPPARIA** Conrad, 1855.

Lapparia Conrad, 1865, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 260; Conrad, 1865, p. 24; Dall, 1890, p. 79, pl. 6, fig. 6; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 111.

Genotype by monotypy *Mitra dumosa* Conrad. Eocene. United

[564]Dall, W. H., 1890, p. 75.

States.

This group of Volutes with a mitroid form seems to be as in the case of *Caricella,* confined to the Eocene of the Mississippi embayment. *Lapparia* has the embryonic whorl as in *Caricella.* The group is more specialized than *Caricella.*

Lapparia pactilis (Conrad) Plate 62, figs. 4, 6, 7; Plate 89, fig. 4

Mitra pactilis Conrad, 1833, p. 46; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 43, pl. 16, fig. 21; H. C. Lea, 1848, p. 101; d'Orbigny, 1850, p. 355; Cossmann, 1893, p. 37.
Voluta dubia H. C. Lea, 1840, Amer. Jour. Sci., vol. 40, p. 103, pl. 1, fig. 23; de Gregorio, 1890, p. 75, pl. 5, fig. 49 [partim] non *V. dubia* Broderip, 1828.
Mitra georgiana Conrad, 1850, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. 11, p. 39, pl. 1, fig. 4.
Lapparia pactilis Conrad, 1865, p. 24; Conrad, 1866, p. 16; Dall, 1890, p. 79 [partim].
Mitra (Lapparia) pactilis de Gregorio, 1890, p. 72, pl. 5, fig. 39.
Mitra clairbornensis Conrad, 1860, Jour. Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, pl. 47, fig. 6 not described, well figured.
Mitra dubia (Lea) de Gregorio, 1890, p. 75, pl. 5, figs. 56-60.
Turricula dubia (Lea) Cossmann, 1893, p. 37.

Subfusiform; with seven volutions, a single row of nodules on each, except the two from the apex, which are smooth; apex papillated; spire elevated; columella with four folds; aperture nearly half the length of the shell.—[Conrad, 1833].

Subfusiform; spire much elevated; superior half of the whorls plain and concave above, inferiorly convex and nodulous; suture profound; apex pappillated; columella 4-plaited.

Locality.—Claiborne, Alab.

Although the pappillated apex of this shell is at variance with the *Mitræ,* as characterized by Lamarck, yet its other characters are decidedly those of the genus.—[Conrad, 1835].

The first whorl of the conch may show the spiral lines coarsely developed with longitudinal lines of equal strength, but it is usually smooth. The nodes as developed in *L. pactilis* are small and range from 12 to 14 or more in number. The average number in the form is twice that of *L. mooreana* and *dumosa.* Most commonly the body whorl is smooth. Some specimens show the nodes small but sharp. Such a specimen was figured by Conrad in 1860 under the name of *Mitra clairbornensis* but not described. The figure is good and may be easily identified. De Gregorio noticed the relationship of Conrad's figure with *Lapparia* but he placed it under *L. dubia* H. C. Lea which he failed to recognize as the young of *pactilis* Conrad. *Mitra georgiana* Conrad, 1850, from the Eocene of Georgia is also *L. pactilis* Conrad.

The Conrad type collection consists of 5 specimens which exhibit a variation in shape and nodosity. One specimen may be that which was figured as *M. claibornensis*. A Conrad label states *"Tortomitra" pactilis* Con., another *"Lapparia pactilis* Conr.".

Dimensions.—Height, 29 mm., greatest diameter, 13 mm., lectotype. Height, 12 mm.; greatest diameter, 8 mm., holotype *Voluta dubia* H. C. Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 13172, A. N. S. holotype *Voluta dubia* H. C. Lea.'

Occurrence.—Gosport sand: locality 104 (type); Georgia (Conrad).

Lapparia dumosa (Conrad) Plate 62, figs. 1, 3

Mitra dumosa Conrad, 1854, in Wailes Rept. Ag. and Geol. Miss., pl. 15, fig. 4.

Mitra (Lapparia) dumosa Conrad, 1855, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 260.

This Jackson species is not inserted in this work with complete discussion of its literature, etc. The three named forms of *Lapparia* are so closely related that a description of the history of the Claibornian characters of the stock would not be complete without the further development in the Jackson. The form of *Lapparia* described as *dumosa* by Conrad is spinose with a spire about two-thirds the height of the body whorl. When many specimens are examined it is seen that while a few may have the lower and middle portion of the whorls smooth, the majority of the shells have fine but conspicuous, spiral lines alternating in size or with wide interspaces over the whole surface. On further examination of the Jackson Lapparias one finds that there are a large number of specimens which retain the complete, spiral sculpture and develop in old age only a series of faint nodes. Some have only an angulated contour where the nodes would be situated. It would seem as though *L. dumosa* was a variety with the node development accelerated, of the non-nodose forms. The Jackson form without spinose character, has been referred to *L. pactilis* but the relationship is more with *dumosa*. *L. dumosa* is a variety of the non-spinose Jackson form.

Lapparia dumosa exigua, new variety Plate 62, figs. 2, 5

Shell stout; nucleus typical; general characters shown by the illustration.

The variety differs from *L. dumosa* in the absence of large spines and in having slightly coarser spiral threads over the entire surface. Some specimens have incipient nodes or poorly developed spinose nodes on the body whorl or lower whorls of the spire. While *dumosa* has 6-8 spines, *exigua* has 10 or more nodes.

Although the young of *L. pactilis* is spirally striate, the adult is smooth. Some specimens are nodose. *L. exigua* differs from *pactilis* in being coarsely striate, and in the character of the obscure nodes. The nodes in *L. exigua* when present are incipient spines and are situated as in *L. dumosa,* near the midline of the whorls. In *L. pactilis* they are longitudinal and extend from the midline to the suture below. They are the remnants of longitudinal folds which are stronger in the adolescent stages.

Dimensions.—Height, 32 mm.; greatest diameter, 15 mm.

Syntypes.—Nos. 3202 and 3203, Paleontological Research Institution.

Occurrence.—Jackson Eocene: one-half mile below Gibson's Landing and Montgomery, La.

Lapparia mooreana (Gabb) Plate 62, figs. 8-16; Plate 88, fig. 12

Mitra mooreana Gabb, 1860, Acad. Nat. Sci. Phila., Jour., 2d ser. vol. IV, p. 383, pl. 67, fig. 24.
Lapparia mooreana (Gabb) Conrad, 1865, p. 24; Conrad, 1866, p. 16; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 112, pl. 8, fig. 9.
Lapparia dumosa Heilprin, 1891, p. 396.

Shell subfusiform, whorls eight, apex mamillated, suture distinct; mouth about half the length of the shell, outer lip sharp, plain, inner lip heavy, four large folds on the columella; surface marked by short spinous nodes on the angle of the whorls (about eight on the body whorl), and by numerous fine revolving lines, crossed by prominent lines of growth.

Dimensions.—Length 1.05 in., length of mouth .6 in., width of body whorl, including spines, .5 in.

Locality.—Wheelock and Caldwell County, Texas. The figure was accidentally reversed.—[Gabb, 1860].

Because of the priority of naming, this lower Claiborne species as well as the varieties of the *Lapparia* stocks as developed in the Jackson Eocene have been designated by workers as a variety of the *L. pactilis* Conrad of the Gosport sand. But geologically and ontogenitically *L. mooreana* represents the origin and main development so far as the southern Eocene Basin is concerned.

The young stages of all the forms are sculptured with spiral lines and longitudinal ridges which later result in nodes. The individuals of the nodose forms which become smooth except for the nodes have in maturity pronounced spiral lines on the young shells and on younger whorls of the spire of adult, smooth shells. *L. pactilis* of the Gosport sand, the smoothest of the species, has the young whorls sculptured with spiral lines and longitudinal ridges. In the ontogeny the development is that of greater sculpture to smoothness of surface, with or without more pronounced spinosity. In geologic history, the more sculptured form occurs the earliest as well as a recurrence of the type in the later Eocene, in the form of *dumosa*. *L. pactilis* is the Claibornian development with a degeneration of sculpture. The shells in the Jackson which have been referred to *L. pactilis* are not typical *L. pactilis* of the Gosport sand. Typical *L. pactilis* has the body whorl and the lower part of each of the whorls of the spire smooth. Spiral lines occur on the upper portion of each whorl but usually microscopically developed. Each whorl has a spiral row of nodes but the nodes are subdued. The Jackson forms referred to *L. pactilis* are the variation from *L. dumosa* of the same age. They have the nodes subdued but they have spiral lines distinctly developed over the whole surface of the shell. The revolving ribs have interspaces equal to the width of the rib. A few specimens become smooth and show the relationship with *L. pactilis*.

L. mooreana, the oldest of the stock, shows a variation of characters in its own specific development. The young of some individuals at some localities have the whole surface of the shell with conspicuous spiral lines. The nodes are distinctly spinose. At other localities the lower part of the whorls is smooth and the spiral lines occur only above the row of spiny nodes. The adults may retain such sculpture or they may become entirely smooth except for the nodes and sculpture on the apical whorls. The height of the spire varies. It may be from two-thirds the height of the body whorl to equal to or slightly longer than the body whorl. It is on the average higher than the spine in *L. dumosa* of the Jackson. The number of nodes in the adult ranges from 7 to 12. In the young the number of nodes ranges from 7 to 16 at some localities.

L. mooreana has been referred by authors to *L. dumosa* of the Jackson. The whole development of the *Lapparia* stock is so intimate that it will be a matter of opinion which is the species and which the varieties. *L. mooreana* is retained as distinct from *L. dumosa* although they represent the same sort of de-development, that of spinosity. It is logical to expect the greater development of such characters as well as greater variation in the lower Claiborne and Jackson times than in the upper Claiborne when the smoother form with less variation occurred. The marine waters were restricted in the upper Claiborne, while earlier in the lower Claiborne and again in the Jackson the marine embayments extended over a wide territory allowing normal marine conditions. *L. mooreana* (lower Claiborne) varies in shape and in the number of spines but the variation in shape seems to be in an increase in height. In *L. dumosa* there is variation in the amount of spinosity but the shape seems to remain more constant in the spinose form. *L. dumosa* has a greater width than *L. mooreana* and is on the average a shorter form. *L. dumosa* is stout and plump. The spines on the body whorl are considerably larger in *dumosa* than *mooreana*.

Gabb's original figure is reversed. The Meyer drawing of the type is included.

Dimensions.—Height, 26 mm.; greatest diameter, 13 mm., holotype.

Holotype.—No. 13273, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 725, 726, 727, 728, 729, 731, 733, 741, 767 and 803; Caldwell County, Texas (type).

Genus **CARICELLA** Conrad, 1835.

Caricella Conrad, 1835, p. 44 two species given, type not designated; Conrad, 1865, p. 24 type not designated; Dall, 1890, p. 78 "types *C. prætenuis* Conrad and *C. pyruloides* Conrad;" Cossmann, 1899, p. 129 type designation *Turbinella piruloides* Conrad.

Genotype by subsequent designation, Cossmann, 1899, *Turbinella pyruloides* Conrad. Eocene. United States.

Caricella pyruloides (Conrad) Plate 63, figs. 1-3, 6, 9-12; Plate 89, fig. 3

Turbinella pyruloides Conrad, 1832, p. 24, pl. 10, fig. 1; Conrad, 1834, App. in Morton, p. 6; H. C. Lea, 1848, p. 106; Harris 1895, p. 38.
Voluta Parkinsonii Lea, 1833, p. 175, pl. 6, fig. 184 immature shell; Harris, 1895, p. 32.
Caricella pyruloides Conrad, 1835, p. 44; Conrad, 1865, p. 24; Conrad, 1866, p. 16; de Gregorio, 1890, p. 67, pl. V, figs. 24-28, 30, 31; Dall, 1890, p. 78; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 130, pl. V, figs. 7-8 *piruloides*.
Voluta piruloides (Conrad) Cossmann, 1893, p. 39 [partim].

Pyriform, ventricose, smooth; with obscure spiral striæ on the inferior half of the body whorl; spire very short; apex slightly mammillated; columella with 4 distant oblique plaits.

Locality.—Claiborne, Alab.; very abundant. Middle Ter........—[Conrad, 1832].

The nucleus consists of one and a half large whorls, bulbous, with the suture line obscure. The young of this species is finely striated with spiral lines over the whole surface of the whorls. On medium aged specimens of 30 to 40 mm. in height the striæ on the upper half of the body whorl become obsolete and the surface is smooth. On fully grown specimens the lines are gone from the surface of the body whorl except sometimes faintly along the base. The spiral lines remain on the whorls of the spire of the adults. The spiral lines on this species differ from those on *C. prætenuis* Conrad, by being finer with interspaces equal to or wider than the line. On *C. prætenuis* the spiral ribs are wide with only linear interspaces. *C. prætenuis* differs also from this species by having five instead of four columellar plications. *C. pyruloides* occasionally shows the five plications. The young of *C. prætenuis* may be confused in shape with the young of *C. pyruloides.*

The spiral lines of this species are like those on *C. bolaris* Conrad but the species differs from *bolaris* in the shape of the whorls as well as *bolaris* having the spiral lines more conspicuous below the suture. The whorls of *C. bolaris* have the sides distinctly convex on the upper half and concave on the lower half of the whorl. Both species are abundant in the Gosport sand at Claiborne Bluff. *C. pyruloides* is the most abundant and reaches the maximum size of all the Claibornian species of *Caricella.*

There is a variation of the shape of the adults of *C. pyruloides.*

Some shells increase greatly the diameter of the body whorl in proportion to the height so that they are shorter and broader than the average.

The representative of *C. pyruloides* (Conrad) in the Jackson Eocene is *C. polita* Conrad[565] (plate 63, figs. 4, 7) a variety of *pyruloides*. The fine, large *C. podagrina* Dall[566] is the related Sabine Eocene species as is *C. subangulata* Conrad[567] of the Jackson. The change in both species has been more than varietal.

De Gregorio placed *C. bolaris* as a mutation of *pyruloides* as well as naming a new variety of *pyruloides sita*. The illustration of *sita* appears more like *bolaris* in shape than it does like *pyruloides*.

Lea figured an immature shell which he called *Voluta Parkinsonii*. Meyer[568] confused the form with *C. polita* Conrad from the Jackson.

Dimensions.—Height, 55 mm.; greatest diameter, 29 mm., lectotype. Height, 28 mm.; greatest diameter, 10 mm., lectotype *Voluta Parkinsonii* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5886, A. N. S. *Voluta Parkinsonii* Lea lectotype.

Occurrence.—Claibornian: locality 136. Gosport sand: locality 104 (type).

Caricella doliata (Conrad) Plate 64, figs. 9-11; Plate 89, fig. 11

Mitra doliata Conrad, Sept. 1833, p. 34; H. C. Lea, 1848, p. 101; Harris, 1895, p. 16.
Turbinella prisca Conrad, 1834, App. in Morton, p. 6.
Voluta prisca Conrad, 1835, p. 43, pl. 16, fig. 9; Harris, 1895, p. 36.
Voluta Cooperii Lea, Dec. 1833, p. 175, pl. 6, fig. 185; Cossmann, 1893, p. 38; Harris, 1895, p. 13.
Caricella doliata Conrad, 1865, p. 24; Conrad, 1866, p. 16.
Voluta (Caricella) Cooperi (Lea) de Gregorio, 1890, p. 66, pl. 5, figs. 8, 9.
Voluta cogitabunda de Gregorio, 1890, p. 66, pl. 5, figs. 10, a, b, c.

Shell subturbinate, ventricose, striated towards the base, unarmed; shoulder rounded; spire a little elevated, obtuse; columella five toothed. Length about one inch.

Locality, Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Obovate, ventricose, thin; spire depressed; apex obtuse; whorls plicated

[565] Conrad, T. A., Wailes Rept. Agr. and Geol. Miss., pl. XVI, fig. 4, 1854; Conrad, T. A., Acad. Nat. Sci. Phila., Proc. vol. VII, p. 261, 1855.

[566] Dall, W. H., 1890, p. 86; Dall, W. H., 1893, p. 228, pl. 20, fig. 9.

[567] Conrad, T. A., idem, pl. XV, fig. 8, 1854; Conrad, T. A., idem, p. 261, 1855.

[568] Meyer, O., Amer. Jour. Sci., 3d ser. vol. 29, p. 468, 1885.

at the suture; base profoundly striated; columella with 4 rather oblique subequal compressed folds; aperture effuse.

Sny. Voluta cooperii, *Lea, Con. p.* 175, *pl.* 6, *f.* 185.

Locality. Claiborne, Alab.

The coloured markings still remain on some specimens and exhibit revolving series of dark quadrangular spots. I described this shell as a *Turbinella,* in No. 4, first edit. but the base is not channelled and is slightly emarginate.—[Conrad, 1835].

Conrad described this distinctive form under the name of *doliata.* He did not figure a specimen but later described the same species under *Voluta prisca* and figured the type. In 1865 he designated his former procedure. The Meyer drawing of one of the Conradian types is the figure of *C. doliata* which is the same as the published drawing of *V. prisca.*

On the shoulder of the body whorl and above the sutural region on the whorls of the spire of young and medium sized individuals is a series of low, elongate nodes. These nodes on some specimens of 20 mm. to 25 mm. in height are distinct. There are however, individuals of the same size which have the whorls smooth. The largest individuals of the species are smooth or faintly show the nodes. The character is not constant and does not seem to be of varietal rank for the reason that many which are smooth have the wavy nodes on the spire. Others have the spire with the nodes only obscurely developed. There is a variation in the twist of the canal. Commonly the canal is twisted to the left with a conspicuous concavity on the left side of the canal. Many others, however, have the canal very much straighter.

De Gregorio apparently did not examine enough specimens to see that the development of axial ribs was a part of the normal growth of the species. Conrad's type specimen of *doliata* is a specimen with nodes. De Gregorio gave the name *cogitabunda* to specimens with nodes. De Gregorio's name is superfluous.

Dimensions.—Height, 30 mm.; greatest diameter, 21 mm., lectotype. Height, 31.5 mm.; greatest diameter, 22 mm., lectotype *Voluta cooperii* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5887, A. N. S. lectotype *Voluta cooperii* Lea.

Occurrence.—Gosport sand: locality 104.

Caricella bolaris (Conrad) Plate 64, figs. 1, 2, 5, 6

Mitra bolaris Conrad, Sept. 1833, p. 34; Conrad, 1835, p. 43, pl. 16, fig. 11; H. C. Lea, 1848, p. 101; Harris, 1895, p. 8.
Turbinella bolaris Conrad, 1834, App. in Morton, p. 6.
Mitra Flemingii Lea, 1833, Dec., p. 170, pl. 6, fig. 177; H. C. Lea, 1848, p. 101; Conrad, 1865, p. 24, *Caricella;* Conrad, 1866, p. 16, *Caricella;* Harris, 1895, p. 19.
Mitra Humboldtii Lea, 1833, Dec., p. 170, pl. 6, fig. 178; H. C. Lea, 1848, p. 101; Harris, 1895, p. 22.
Caricella bolaris Conrad, 1865, p. 24; Conrad, 1866, p. 16.
Voluta (*Caricella*) *pyruloides* Conrad mut. *bolaris* (Conrad) de Gregorio, 1890, p. 68, pl. 5, figs. 13-14.
?*Voluta* (*Caricella*) *pyruloides* var. *sita* de Gregorio, 1890, p. 68, pl. V, figs. 15-16.
Caricella pyruloides Conrad var. *bolaris* (Conrad) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 130.

Shell subfusiform, transversely striated; whorls five; spire rather short, mammillated; columella with four teeth. Length, about one inch.
Locality. Claiborne, Alab.
Cab. Acad. N. S.—[Conrad, 1833].
Subfusiform, with fine close spiral lines; superior portion of the whorls slightly concave, inferior convex; spire elevated; apex obtuse; columella with 4 thick plaits; base slightly reflected and produced; subemarginate.
Syn. Mitra humboldtii, M. flemingii, Voluta parkinsoni, *Lea, Con. pl.* 6, 177, 178, 184.
A common species. No. 3, first edition, p. 34.—[Conrad, 1835].

De Gregorio and Cossmann regarded this species as a variety of *C. pyruloides*. The differences have been discussed under the latter.

There is considerable variation in this species in the height of the spire and in the reflected canal. Lea tried to show this in his distinction between the two synonymous names *Mitra Flemingii* and *Mitra Humboldtii*. On first examination of a collection of the species the difference seems to be constant but on close comparison one finds there are transitions between all the variants which the species develops.

Microscopic examination of specimens of *C. bolaris* which superficially appear to be smooth reveal a faint, underlying, striated surface.

The spiral striations in *C. bolaris* and *recticulata* vary in the same manner. The ribs of the post-nuclear whorls are finer. The interspaces increase to twice or three times the size of the ribs on some specimens. Generally the ribs remain finer and the interspaces smaller in *C. bolaris* than in *C. recticulata*.

Dimensions.—Height, 35 mm.; greatest diameter, 16.5 mm., lectotype *C. bolaris.* Height, 29 mm.; greatest diameter, 14 mm., lectotype *Mitra Flemingii* Lea. Height, 23 mm.; greatest diameter, 12 mm., lectotype *Mitra Humboldtii* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5876, A. N. S. lectotype *Mitra Flemingii* Lea. No. 5878, A. N. S. lectotype *Mitra Humboldtii* Lea.

Occurrence.—Gosport sand: locality 104.

Caricella prætenuis (Conrad) Plate 64, figs. 7, 8; Plate 89, fig. 8

Turbinella prætenuis Conrad, Nov., 1833, p. 45; Conrad, 1834, App. in Morton, p. 6; Conrad, 1835, p. 44, pl. 17, fig. 1; Harris, 1895, p. 36.
Voluta striata Lea, 1833, p. 174, pl. 6, fig. 183; Harris, 1895, p. 43; de Gregorio, 1890, p. 69, pl. V, fig. 66, *Caricella.*
Caricella prætenuis Conrad, 1865, p. 24; Conrad, 1866, p. 16; Tryon, 1882, Man. Conch., vol. IV, p. 67, pl. 3, fig. 35; Tryon, 1883, Struct. and Syst. Conch., vol. II, p. 161, pl. LII, fig. 2.
Voluta (Caricella) prætenuis (Conrad) de Gregorio, 1890, p. 69, pl. 5, fig. 20.

Subfusiform, thin, ventricose, with spiral impressed lines; spire prominent; apex very obtuse; volutions slightly indented; columella four plaited; base narrowed and somewhat elongated.—[Conrad, 1833].

Pyriform, very thin, with revolving impressed lines, profound at base; whorls superiorly indented; spire cancellated; suture defined by a prominent line; apex papillated; collumella 5 to 6-plaited; plaits compressed; base prolonged, slightly twisted, somewhat attenuated.

Locality.—Claiborne, Alab.

This shell is evidently congeneric with *T. pyruloides* which Mr. Lea absurdly refers to *Voluta*, whereas its characters are just the reverse of those of the true Volutes, the folds decreasing in size from above, as in *Mitra*, and the *base canaliculate and not emarginate.*

If these two shells will not agree either with the *Turbinellæ* or *Mitræ*, they will form a new sub-genus, which might be termed Caricella.—[Conrad, 1835].

De Gregorio placed Aldrich's *C. reticulata* in synonymy with this species but the affinities of *C. reticulata* are with *C. bolaris.* As explained under *C. pyruloides* the character of the ribbing is different in *C. prætenuis* than the group of *C. pyruloides, bolaris* and *reticulata.*

The young of this species as in *C. pyruloides* have the surface completely covered with revolving striæ. The revolving striæ die out with age as in *pyruloides* so that older specimens have the upper portion of the body whorl smooth. This species is rarer than *C. pyruloides.* Lea described a broken immature shell as *Voluta striata.*

The nucleus is broader and not so sharply pointed as depicted by Conrad. Large specimens in the Conrad collection have 4 large plications as described by Conrad. A medium sized specimen has 5 plications and the lectotype of *Voluta striata* Lea, young (*prætenuis*) has 5, large plications.

Dimensions.—Height, 32 mm.; greatest diameter, 27 mm., lectotype. Height, 15 mm.; greatest diameter, 10 mm., lectotype *V. striata* Lea, young (*prætenuis*).

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. Lectotype *V. striata* Lea, No. 5885, A. N. S.

Occurrence.—Gosport sand: locality 104.

Caricella demissa texana (Gabb) Plate 65, figs. 8, 14, 15

Cymbiola texana Gabb, 1860, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 382, pl. 67, fig. 33.

Caricella demissa Harris, 1892, Exp. Sta. Rept., pt. I, Geol. and Agr., A preliminary Report upon the Hills of La., by Otto Lerch, p. 27.

Caricella demissa Con. var. *texana*, (Gabb) Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 68, pl. 6, fig. 9.

Fusiform, whorls five, rounded and somewhat truncated at the upper parts, suture very distinct, apex mammillated; mouth? (very much broken, in the only specimen I have seen;) columella straight, inner lip above faintly striate, below with four oblique folds; surface polished, but showing minute revolving lines on the upper whorls and near the base of the body whorl, which are crossed by equally delicate longitudinal lines giving the first three whorls a finely cancellated appearance.

Dimensions.—Length about 1 in., width of body whorl .4 in.

Locality.—Wheelock, Texas. Collection of the Smithsonian Institution. —[Gabb, 1860].

Prof. Harris, who had more specimens than Gabb, revised the notes on this form and cited additional localities of occurrence. Harris described the shape of the canal of his specimens as recurved. Gabb stated the columella was straight. The only specimen Gabb claimed to have seen is the type which had the canal broken. The Harris collections contain several specimens from Hammetts Branch, La., which show a straighter canal than that of the specimen figured by Harris.

Prof. Harris[569] pointed out a variety of *C. demissa* from the Sabine Eocene of Alabama. Typical *demissa*[570] was described from the Vicksburg Oligocene.

[569]Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 36, pl. 4, figs. 6, 7, 1899 as *Scaphella*.

[570]Conrad, T. A., Acad. Nat. Sci. Phila., 2d ser. Jour., vol. I, p. 120, pl. 12, fig. 5, 1848.

Caricella is represented in the Midway Eocene by *C. Leana* Dall[571].

The Meyer drawing of the type of *C. demissa* is included.

Holotype.—Not found.

Occurrence.—Lower Claiborne: locality 730.

Caricella subangulata cherokeensis Harris Plate 63, figs. 5, 8

Caricella subangulata Conrad var. *cherokeensis* Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 68, pl. 6, fig. 10.

Size and general form as indicated in the figure; whorls 5; 1 mammillated; 2, 3, 4 spirally striate, suture distinct; body whorl shouldered, spirally striate above and also at the base of the whorl; columellar plaits four, the lower two more oblique.

Typical *subangulata* is larger, but with about one less whorl, and with lower and more obtuse spire.

Localities.—Mosley's Ferry, Brazos River, Burleson Co.; two miles west of Crockett, Houston Co.; Collier's Ferry, Burleson Co.; two miles east of Alto, Cherokee Co.; Collard's farm, Sparks' Headright, Brazos Co., Texas.

Geological horizon of the variety.—Lower Claiborne Eocene.

Type of the variety.—Texas State Museum.—[Harris, 1895].

Typical *C. subangulata* Conrad occurs in the Jackson. It may be derived from the *C. pyruloides* stock but the separation has been great enough to warrant specific designation. *C. pyruloides* has the upper slope of the body whorl more rounded and *C. subangulata* has the slope as the name implies. *C. podagrina* the Sabine member of probably the same stock has the slope so angulated that it forms a shoulder.

The lower Claiborne variety of *subangulata* is more slender than the Jackson form.

Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas, Probably lost.

Occurrence.—Lower Claiborne: localities 727 and 767.

Caricella claibornensis Harris Plate 64, figs. 3, 4

Caricella claibornensis Harris, 1895, Dana's Manual of Geol., 4th ed. p. 897, fig. 1489; Harris, 1895, Bull. Amer. Pal., vol. 1, No. 1, p. 49, pl. 1, fig. 3.

This species is distinct from the other Claibornian species of *Caricella* in having the line of the left side of the body whorl from the shoulder to the anterior canal, and the line of the labium from posterior to the anterior end, straight.

[571]Dall, W. H., 1890, p. 86, pl. 6, fig. 9.

No. 113843, U. S. Nat. Museum, catalogued[572] as the holotype of *Caricella claibornensis* is not *C. claibornensis* Harris. The specimen in the box No. 113843 when examined was *C. doliata* Conrad.

Dimensions.—Height, 31 mm.; greatest diameter, 13 mm.

Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas. Probably lost.

Occurrence.—Gosport sand: locality 104.

Caricella reticulata stenzeli, new variety Plate 65, figs. 17-20

Shell slender; nucleus typical; post-nuclear whorls continuous, striated with coarse, spiral ribs, young whorls concave in the middle; convex just below the suture; on the older whorls the concave area is below the rolled lower margin of the suture; anterior canal curved to the left; plications four; immature shells finely striated over the entire surface, the lines may be retained in the adult but commonly the middle portion of the body whorl is smooth.

The species which is called a variety is the initial stock from which in the Jackson and Oligocene resulted in *C. reticulata* Aldrich[573]. Priority in naming often misconstrues biologic relationships.

C. stenzeli differs from *C. reticulata* (Plate 65, figs. 12, 13) in having a more elevated spire. In *C. stenzeli* the tendency is for the spiral ribs to become obsolete with age while in *C. reticulata* the spiral ribs increase in strength with age and the longitudinal lines of growth become thread-like.

One, large specimen, plate 65, fig. 17 bears a close resemblance to *C. reticulata stenzeli.* It has an enlarged body whorl, striated concave areas and smooth lower whorls. Its size suggests a gerontic specimen of *stenzeli.*

Named in honor of Dr. H. B. Stenzel of the Bureau of Economic Geology, University of Texas, Austin, Texas.

Syntypes.—Nos. 3240, 3242 and 3243, Paleontological Re-

[572]Schuchert, C. and others, Bull. U. S. Nat. Mus., No. 53, pt. I, p. 133, 1905.

[573]Aldrich, T. H., Jour. Cincinnati Soc. Nat. Hist. vol. VIII, p. 147, pl. 2, figs. 4, a, b, c, 1885; Aldrich, T. H., Geol. Sur. Ala. Bull. 1, pt. I, p. 27, pl. 2, figs. 4, a, b, c, 1886.

search Institution.

Occurrence.—Lower Claiborne: localities 727, 728, 731, 734, 743 and 803.

Caricella, sp. Plate 61, fig. 1

A single young specimen of a distinct *Caricella* was found from Wautubbee, Miss. The nucleus is typical. The first post-nuclear whorl has coarse, spiral ribs. On the second whorl strong longitudinal folds in addition to the spiral lines extend the length of the whorl. The spiral lines cover the whole surface of the body whorl and the longitudinal die out anteriorly. There are four, strong plications.

There is no known species of *Caricella* in the Claibornian fauna which has the young stage like this specimen.

Specimen figured.—No. 3198, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 731.

Family HARPIDÆ

Genus HARPA (Bolten) Roeding, 1798[574]

Genotype by tautonymy *Buccinum harpa* Gmelin[575] (=*H. ventricosa* Lam.=*H. major* (Klein) (Martini) Bolten).

Harpa, sp. Plate 65, fig. 6

A fragment of a *Harpa* was found in material from loc. 725. The specimen not complete enough for specific or subgeneric determination, exhibits the characteristic sculpture of *Harpa*. The fragment is of the anterior portion of the back of the shell including a complete anterior notch. Strong, wide, curved, longitudinal ribs are present with fine, cancellate lines in the interspaces. Such ornamentation is present on *H. jacksonensis* Harris[576] from the Jackson Eocene at Jackson, Miss. as well as other species of the subgenus *Eocithara* Fischer[577] to which the

[574]Bolten, J. F., Roeding, P. F., 1798, p. 149.

[575]Vokes, H. E., Jour. Pal., vol. II, No. 10, 1937. As far as Bolten's original species are concerned the type by tautonymy is not as simple as stated. Bolten gave three species *H. major*, H. *cithara* and *H. nobilis* as equivalent to the *Buccinum harpa* Gmelin. Authors regard the first only as the equivalent of *B. harpa* Gmelin.

[576]Harris, G. D., Acad. Nat. Sci. Phila., Proc. vol. 48, p. 472, pl. 18, fig. 10, 1896.

[577]Fischer, P., Man. de Conch., p. 601, 1883.

Jackson species belongs.

Vokes[578] pointed out the presence of two species of *Eocithara* in the Domengine Eocene of California.

The present fragment is the first indication of a *Harpa* in the southern Claibornian.

Specimen figured.—No. 3235, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 725.

Genus **LYRISCHAPA** Aldrich, 1911[579]

Genotype by original designation *L. harrisi* Aldrich. Lower Claibornian Eocene. Mississippi.

Lyrischapa harrisi Aldrich — Plate 57, figs. 1, 2

Voluta sp. Dall, 1890, pp. 77, 90, pl. 6, fig. 5a.
Lyrischapa harrisi Aldrich, 1911, Bull. Amer. Pal., vol. V, No. 22, p. 11, pl. IV, fig. 8.

This genus is known as yet by the type an imperfect specimen and a specimen in the U. S. Nat. Museum.

Holotype.—No. 2355, Paleontological Research Institution.

Occurrence.—Lower Claiborne: 3½ miles south of Quitman, Miss. (type); 4½ miles S. W. from Enterprise, Miss. (Dall); locality 803.

Genus **CRYPTOCHORDA** Mörch, 1858[580]

Genotype by monotypy *Buccinum stromboides* Hermanns. Eocene. France. England.

Cryptochorda mohri (Aldrich) — Plate 65, figs. 9, 10

Buccinum Mohri Aldrich, 1886, Bull. Geol. Sur. Ala., vol. I, pt. I, p. 26, pl. III, fig. 16; de Gregorio, 1890, p. 106, pl. 7, figs. 63, 64.
Cryptochorda mohri (Aldrich) Cossmann, 1893, p. 38; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 78.

Shell rather solid; spire high; apex obtuse; whorls seven, rounded; suture rather shallow; surface smooth. Lines of growth coarse, showing on the body whorl. Outer lip strongly reflected, slightly shouldered at its junction with the body whorl. Aperture semi-lunate nearly two-thirds the length of the shell, smooth internally, terminating in a short, excised canal.

Locality.—Lisbon, Ala.

This species has some resemblance to *Buccinum stromboides*, Herm., from the Calcaire Grossier, of Grignon, but lacks the striations on the lower part of the body whorl, is less swollen in outline, and has a more

[578] Vokes, H. E., Jour. Pal., vol. II, No. 1, pp. 10-12, pl. 2, 1937.
[579] Aldrich, T. H., Bull. Amer. Pal., vol. V, No. 22, p. 11, 1911.
[580] Morch, O. A. L., Jour. de Conch., 2d ser. tome III, p. 43, 1858.

strongly reflected outer lip. Named in honor of Dr. Chas. Mohr, of Mobile, Ala.—[Aldrich, 1886].

C. mohri is a typical representative of *Cryptochorda* in the American Eocene. It differs specifically from *C. stromboides* Herm., the type of the genus, by those features which Aldrich delineated. The genus is limited to the Paleocene and Eocene[581]. *C. californica* (Cooper)[582] from the Capay and Domengine Eocene of California is more closely related to the Parisian genotype than is the Claibornian species.

Aldrich described the species from Lisbon, Ala. J. E. Adams sent a specimen which he collected at Smithville, Texas. The Smithville specimen is not typical. It is shorter spired, more convex posteriorly and the outer lip is more rounded than the type. It does show on the inner margin of the inner lip faint crenulations.

The nucleus is smooth and globose.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 733 and 734 (type).

Family MITRIDÆ

Genus MITRA Martyn, 1784

Mitra Martyn, 1784, Univ. Conch., vol. 1, tab. 1, fig. 19 first species *M. tessellata* Martyn.

Non *Mitra* Lamarck, 1799, Prodrome, p. 70, *V. episcopalis* Linn. type designation, Children, 1823.

Mitra (Martyn) Dall, 1905, Proc. U. S. Nat. Mus., vol. 29, p. 428 type designation *M. tessellata* Martyn; Dall, 1915, Bull. U. S. Nat. Mus., No. 90, p. 59.

Genotype by subsequent designation, Dall, 1905, *M. tessellata* Martyn. Living. Indo-Pacific.

Genus MITRARIA Rafinesque, 1815

Mitra Lamarck, 1799, p. 70 non *Mitra* Martyn, 1784, vol. 1, table 1, fig. 19.

Mitraria Rafinesque, 1815, p. 145 substitute for *Mitra* Lam., 1799; Iredale, 1911, Proc. Mal. Soc. Lond., vol. IX, p. 262; Iredale, 1921, ibid, vol. XIV, p. 201.

Mitra (Lam.) Children, 1823, p. 62, Reprint Kennard, Salisbury and

581 Cossmann, M., Essais Pal. Comp. 3 liv., p. 78, 1899.

582 Clark, B. L., Geol. Soc. Amer. Bull. vol. 47, No. 6, pl. I, fig. 5, 1936.

Woodward, 1931, p. 33 designation of type, *V. episcopalis* Linn. for *Mitra* Lam.; Tryon, 1883, p. 168; Fischer, 1884, p. 611; Cossmann, 1899, p. 155.

Genotype by subsequent designation, Children, 1823, *Voluta episcopalis* Linn. Living. Indo-Pacific.

Genus **VEXILLUM** (Bolten) Roeding, 1798[583]

(*Turricula* Klein, 1753; *Vulpecula* Blainville, 1824.)

Genotype by subsequent designation, Woodring, 1928[584], *Vexillum plicatum* (Bolten) Roeding (=*Voluta plicaria* Linné). Living. Indo-Pacific.

Subgenus **UROMITRA** Bellardi, 1887[585]

Genotype by subsequent designation, Cossmann, 1899[586], *Mitra cupressina* Brocchi. Miocene and Pliocene of Italy.

Vexillum (?Uromitra) terplicatum (de Gregorio)

Plate 66, figs. 9, 10; Plate 88, fig. 8

Mitra lineata Lea, 1833, p. 168, pl. 5, fig. 174; H. C. Lea, 1848, p. 101; de Gregorio, 1890, p. 73, pl. 5, figs. 40-42 including *terplicata;* Tomlin, 1931, Nautilus, vol. XLV, No. 2, p. 54; nec *Mitra lineata* Schumacher, 1817; nec *Mitra lineata* Hoeninghaus, 1831; nec *Mitra lineata* Swainson, 1840.

Fusimitra? lineata (Lea) Conrad, 1865, p. 25; Conrad, 1866, p. 16.

Fusimitra lineata (Lea) Heilprin, 1891, p. 396; Cossmann, 1893, p. 38; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 168.

Shell subfusiform, longitudinally and indistinctly ribbed, furnished with a small transverse line below the suture; substance of the shell thin; spire somewhat elevated; suture small; whorls ———, flattened; mouth narrow; columella with four folds; outer lip sharp; within striate.

Length .3, Breadth 3-20th, of an inch.

Observations.—A single specimen only of this species, and that with the spire fractured, has been examined by me. The folds are placed towards the base, which causes it to look somewhat like a *Pyramidella.* The figure of Mr. Murchison's *M. cancellata* from Gosau, has some resemblance to our shell*.—[Lea, 1833].

*Geol. Soc. Trans. Vol. 3, pl. 39, fig. 30.

The name *Mitra lineata* has been used many times in literature and Lea's name is preoccupied twice. De Gregorio gave the name *terplicata* to specimens of the species with three plications instead of four as described by Lea. As Tomlin points out it may be that De Gregorio might not have counted the anterior plication

583Bolten, J. F., Roeding, P. F., 1798, p. 138.

584Woodring, W. P., 1928, p. 244.

585Bellardi, L., I Molluschi dei terreni terziarii del Piermonte e della Liguria, pt. V, (cont.) p. 23, 1887.

586Cossmann, M., Essais Pal. Comp., 3 liv., p. 168, 1899.

as a fold since it is the margin of the columella also. The drawing of Lea's type by Meyer is included herein. The writer is following Tomlin's suggestion and retaining *terplicata* for the specific name in place of adding a new name to replace *lineata* Lea.

The nucleus of the type is broken so that one is unable to discuss the species as to its relationship with *Conomitra fusoides* which has a bulbus nucleus of one and a half or two whorls. *U. exilis* and *gracilis* have an elongate nucleus with four or five whorls. The spiral line below the suture and the columellar area in *terplicata* are similar in *exilis* and *gracilis.*

The character of the plications may be clearly seen in the Harris collection of *U. exilis* (Gabb). The specimens show three strong, typical plications. If the shell is rolled so that the interior of the aperture may be observed, the margin of the labium below may be seen to be raised to form a small plication. This certainly accounts for a difference in the number of plications given in this type of shell. Because of the resemblance of the subgeneric characters of *terplicata* with *gracilis* and *exilis* the species is included under *Uromitra* Bellardi.

Dimensions.—Height, 7.5 mm.; greatest diameter, 3+ mm., lectotype.

Lectotype.—No. 5865, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Vexillum (Uromitra) gracile (H. C. Lea)

Plate 66, figs. 1, 13, 14; Plate 89, fig. 1

Mitra gracilis H. C. Lea, 1841, Amer. Jour. Sci., vol. 40, p. 101, pl. 1, fig. 20; de Gregorio, 1890, p. 75; Harris, 1895, p. 21; non Reeve, 1844.
Turricula cincta Meyer, 1886, Geol. Sur. Ala., Bull., vol. 1, pt. II, p. 74, pl. 1, fig. 74, pl. 1, fig. 13; nec *Mitra cincta* A. Roualt, 1850; nec *Uromitra cincta* Bellardi, 1887; nec *M. cincta* Newton, 1891=*M. newtoni* Cossmann, 1899.

Mitra (*Turricula*) *cincta* (Meyer) de Gregorio, 1890, p. 75, pl. 5, fig. 47.
Fusimitra cincta (Meyer) Cossmann, 1893, p. 38.

M. testâ sub-turritâ, tenui, longitudinaliter et indistinctè striatâ, lineâ transversa propè suturas; spirâ acutâ, valde elevatâ; suturis impressis; anfractibus ———, planulatis; basi striatâ columellâ triplicatâ; aperturâ sub-ellipticâ.

Shell sub-turrited, thin longitudinally and indistinctly striate, with a transverse line near the sutures; spire acute, very much elevated; sutures impressed; whorls ———, flat; base striated; columella with three folds; mouth sub-elliptical.

Length ———. Breadth .1 of an inch.

Remarks.—This little species has the outer lip sharp and without striæ. It resembles *M. lineata,* Lea, in having the longitudinal striæ and transverse line, but differs from that species in other respects. As I have met with but one specimen of this shell, and that with the spire fractured, I am not able to give its length and number of whorls. From the appearance of what I have, I should judge the spire to be very elevated.—[H. C. Lea, 1841].

The slenderness of the shell, with the distinct, spiral line below the suture and fine, longitudinal striations give this species a *Terebra*-like appearance. However the large number of plications on the columella exclude the form from *Terebra.* There are three, large plications with a fourth plication which is small and marginal. The plications are continuous with the basal, spiral ribs. Such characters are typical of *Uromitra.* In those characters the form is similar to *U. exilis* (Gabb). It differs from that species in being more slender, with the sides straighter, and the longitudinal ribs not so well developed but with the spiral groove below the suture better developed. The body whorl is almost smooth. The apical whorls in *gracilis* have only longitudinal ribs.

Lea's illustration is poor. The figure of Meyer is good and the description is more complete than that of Lea. Meyer gave his specimen a new name, suggesting that it might be the same as *gracilis* of Lea. There is little doubt but that the *cincta* of Meyer is the same as *gracilis* of Lea.

Dimensions.—Height, 4 mm.; greatest diameter, 2 mm., (fragment) lectotype. Height, 6 mm.; greatest diameter, 2 mm., holotype. *T. cincta* Meyer.

Holotype.—No. 13164, Academy of Natural Sciences, Philadelphia, Pa. Holotype *Turricula cincta* Meyer, Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: locality 104.

Vexillum (Uromitra) exile (Gabb) Plate 66, figs. 2, 3; Plate 89, fig. 9

Mitra exile Gabb, 1860, Acad. Nat. Sci. Phila., Jour., 2d ser., vol. IV, p. 383, pl. 67, fig. 23; non *Mitra exilis* Tate, 1889.

Mitra (*Callithea*) *exile* (Gabb) Conrad, 1865, p. 25; Conrad, 1866, p. 16.

Fusimitra exilis (Gabb) Heilprin, 1891, p. 396.

Shell subfusiform, whorls eight, the first three smooth and polished, the remainder truncated above; suture deep; mouth small, linear, outer lip simple, four folds on the columella; surface, except the first three whorls, marked on the upper edge, immediately below the suture, by a broad, slightly undulating band, and by prominent longitudinal ribs, which form almost continuous lines from the top of the fourth whorl to near the base of the body whorl, body whorl marked at the base by a few transverse lines, continuation of the folds on the columella.

Dimensions.—Length .25 in., length of mouth .09 in., width of body whorl .08 in.

Common.—[Gabb, 1860].

Nucleus consists of probably five, smooth, elevated whorls. Gabb in counting the whorls of the shell included the whorls of the nucleus. There are five whorls excluding the nucleus. The three folds of the columella are large but the anterior fourth is formed by the raised margin and is small, in some specimens, obscure. The three large plications are continuous with spiral ribs on the base of the body whorl. This same characteristic occurs in *U. gracilis* (H. C. Lea). These species may be readily distinguished from the Conomitras by the difference in the nucleus. The characters of the species are typical of the subgenus *Uromitra* Bellardi.

Dimensions.—Height, 6.5 mm.; greatest diameter, 2+ mm., lectotype.

Lectotype.—No. 13272, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 725, 727 and 733.

Genus **FUSIMITRA** Conrad, 1855

Fusimitra Conrad, 1855, Acad. Nat. Sci. Phila., Proc. vol. VIII, p. 261 *M. conquisita* Con., *M. Mississippiensis* Con. and *M. Mellingtoni* Con. [spelled *millingtoni*, 1854] no type designation; Conrad, 1865, p. 25; Harris, 1897, p. 124; Woodring, 1928, p. 247 nec *Fusimitra* Tryon, 1883 nec Fischer, 1884, nec Dall, 1890, nec Cossmann, 1899.

Fusimitra Grant and Gale, 1931, p. 636 type designation *M. Mellingtoni* Conrad.

Genotype by subsequent designation Grant and Gale, 1931, *Mitra* [*Mellingtoni*] *Millingtoni* Conrad. Jackson Eocene. Southern United States.

The character of *Fusimitra* has long been misunderstood by the example citation of Tryon of *M. cellulifera* Conrad and type designation of the same species by Fischer and Cossmann. *M.*

cellulifera is not a valid species for the type of *Fusimitra* Conrad because it was not listed with the original description of the genus in 1855. The authors were using Conrad's[587] citation of *Fusimitra* of 1865 but that was not his original usage of the name. Such misunderstanding was probably influenced by Dall's[588] misstatements regarding *Fusimitra* and *M. millingtoni.* Dall had not found or had forgotten about Conrad's original description of those forms. The status of *Fusimitra* was elucidated by Harris in 1897[589]. Grant and Gale, 1931, made the designation of *M. mellingtoni* Conrad as the type of *Fusimitra* Conrad. The spelling of the specific name is *millingtoni* and not *mellingtoni* as is commonly given following Conrad, 1855. The first spelling Conrad gave of the name which accompanied the figure of the species in 1854[590] was *millingtoni.* Such was the spelling Conrad meant the species being named in honor of one time Prof. John Millington of the State University of Mississippi.

Fusimitra differs from *Tiara* Swainson[591] in shape, character of the callus, canal, sculpture, and plications on the pillar.

The body whorl of *Fusimitra* becomes constricted, with a concave area, at the posterior line of aperture, while in *Tiara*, the line of the body whorl gradually decreases and the concave area occurs about at the mid-line of the plications. Such is considerably lower than in *Fusimitra.* The basal portion of the aperture in *Fusimitra* is consequently drawn into a canal. In *Tiara* it is hardly more than a notch. The parietal and umbilical calli are larger in *Tiara* than in *Fusimitra.* The sculpture of *Tiara* consists of transverse ribs with longitudinal striæ. *Fusimitra* lacks the longitudinal striæ. The revolving ribs in *Fusimitra* are variable in occurrence. *Tiara* has four or five plications.

Fusimitra perexilis (Conrad)

Plate 66, figs. 7, 8, 16; Plate 88, fig. 5; Plate 89, fig. 12

Mitra perexilis Conrad, 1833, Nov., p. 46; Conrad, 1834, App. in Morton, Conrad, 1835, p. 42, pl. 16, fig. 7; H. C. Lea, 1848, p. 101; d'Orbigny, 1850, p. 355, de Gregorio, 1890, p. 73 pl. 5 figs. 43-44; Harris, 1895,

[587]Conrad, T. A., 1865, p. 25.

[588]Dall, W. H., 1890. p. 94.

[589]Harris, G. F., 1897, p. 124.

[590]Conrad, T. A., in Wailes Rept. Agr. and Geol. of Miss., expl. plate 16, 1854.

[591]Swainson, Wm., 1831, expl. pl. 50. Genotype by subsequent designation, Hermannsen, 1849, *Tiara isabella* Swainson. Living. China.

p. 33; non *Mitra perexilis* Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, expl. pl. 4, fig. 10 mistake for *pergracilis*.
Mitra minima Lea, 1833, Dec., p. 168, pl. 6, fig. 175; de Gregorio, 1890, p. 73, pl. 5, fig. 45; Harris, 1895, p. 28.
Mitra eburnea H. C. Lea 1841, Amer. Jour. Sci., vol. 40, p. 102, pl. 1, fig. 21; de Gregorio, 1890, p. 74, pl. 5, fig. 63; Harris, 1895, p. 17.
Fusimitra ? perexilis Conrad, 1865, p. 25; Conrad, 1866, p. 16.
Fusimitra perexilis (Conrad) Cossmann, 1893, p. 28; Cossmann, 1899, p. 168.
Fusimitra ? minima (Lea) Conrad, 1865, p. 25; Conrad, 1866, p. 16.
Fusimitra minima (Lea) Cossmann, 1893, p. 38; Cossmann, 1899, Essais Pal. Comp. 3 liv., p. 168.

Narrow-fusiform, with seven smooth convex volutions; base strongly striated; aperture contracted; less than half the length of the shell; columella with three plaits.—[Conrad, 1833].

Narrow-fusiform, with smooth convex whorls; spire subulate, much elevated; base with impressed lines; columella 3-plaited; aperture narrow. *Locality*. Claiborne, Alab.—[Conrad, 1835].

The young shells do not slope straight from the body whorl to the anterior canal as in the adults. Occasionally an older shell retains the convex-concave line of the body whorl. Lea gave the name *minima* to a young specimen. *M. eburnea* of H. C. Lea is *perexilis* Conrad. The posterior two plications are stronger. The anterior fold is weak and in some specimens may not be seen.

The *M. marylandica* Clark[592] from the Aquia formation (Sabine) of Maryland appears from the illustration to be related to *perexilis* but when specimens of *perexilis* are compared with the type of *M. marylandica* Clark, No. 115799, U. S. Nat. Mus. a difference between the two species is noted. *M. marylandica* has a longer body whorl with a longer canal. The anterior portion of the body whorl is attenuated more than that of *perexilis*. *M. marylandica* has 3 equal, strong plications. It has a slight shoulder below the suture on the body whorl with spiral lines developed. Such is not developed on *perexilis*.

Dimensions.—Height, 19 mm.; greatest diameter, 6 mm., lectotype. Height, 4.5 mm.; greatest diameter, 2 mm., lectotype *M. minima* Lea. Height, 15 mm.; greatest diameter, 6 mm., holotype *M. eburnea* H. C. Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5866, A. N. S. lectotype *M. minima* Lea. No. 13165, A. N. S., holotype *M. eburnea* H. C. Lea.

Occurrence.—Lower Claiborne: localities 707, 708, 723 and 727. Gosport sand: locality 104 (type).

[592]Clark, W. B., and Martin, G. C., Md. Geol. Sur., Eocène, p. 132, pl. XXI, figs. 9, 9a, 1901.

Fusimitra polita (Gabb) Plate 66, figs. 17, 18; Plate 88, fig. 2

Fasciolaria polita Gabb, 1860, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 382, pl. 67, fig. 28.

Fusimitra polita (Gabb) Heilprin, 1891, p. 396.

Mesorhytis polita (Gabb) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 170, pl. VIII, fig. 14.

non *Mitra polita* Reeve, 1844, Proc. Zool. Soc. Lond. pt. XII, p. 174.

Conomitra polita of authors, non *Conomitra polita* Vaughan, 1896.

Fusiform, whorls ten, rounded, spire elevated; aperture narrow, columella short, straight, outer lip simple, crenate within, columella with three large folds and one small one, the latter the most anterior; surface smooth, with several oblique impressed lines on the lower part of the body whorl.

Dimensions.—Length .6 in., length of mouth .27 in., width of body whorl .18 in.

Resembles *F. elevata* Lea, but has a longer canal and differs in the width of the mouth, the size of the folds and in the absence of all traces of teeth inside the outer lip.

Locality.—Caldwell Co., Texas. My collection.—[Gabb, 1860].

This species is distinct. It differs from *M. perexilis* in being larger, having a larger number of whorls, a more elevated spire, a longer canal and has three plications well developed with occasionally a fourth smaller, anterior plication. The nucleus consists of three smooth whorls. The first whorl is small with the other two large whorls elevated. Only specimens of *M. conquisita* and *M. perexilis* with broken nuclei have been obtained. The portion of the nucleus which is available is similar to that of *F. polita*. Gabb described the outer lip of *polita* as crenate within. The margin of the labrum of the holotype is broken. The surface within is smooth.

A large specimen from Smithville is included to show how the length of the spire and canal increases with advanced age.

Dimensions.—Height, 16 mm.; greatest diameter, 5 mm., holotype.

Holotype.—No. 13280, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: Caldwell County, Texas (type); locality 733.

Fusimitra adamsi, new species Plate 66, fig. 11

Shell small; spire elevated; whorls six; smooth except for spiral ribs on the base of the body whorl; three or four plications on the columella depending on the age of the shell; four plications on the young specimens; sides of the whorls straight and slightly excavated.

This species is intermediate in shape between *F. polita* and *F. perexilis*. It is more slender than *F. perexilis* with about the same number of whorls but with a smaller body whorl. The spire is about the slenderness of *F. polita* but the body whorl is shorter.

The distinguishing feature of *F. adamsi* is the shape of the whorls. While the whorls are slightly convex in *F. polita* and *perexilis*, in *adamsi* they are straight sided with each whorl offset at the suture.

Named in honor of J. E. Adams of Midland, Texas.

Dimensions.—Height, 8 mm.; greatest diameter, 2.5 mm.

Syntypes.—Nos. 3249 and 3250, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 733.

Genus **CONOMITRA** Conrad, 1865[593]

Genotype by subsequent designation, Dall, 1889, *Mitra fusoides* Lea. Claibornian Eocene. United States.

Dall stated[594] that Tryon[595] selected *C. fusoides* (Lea), in 1883 as the type of *Conomitra*. Tryon merely cited the species which is not a valid designation. Dall, himself, designated the type of *Conomitra* in 1889[596].

Conomitra fusoides (Lea) Plate 66, figs. 19, 24-26

Mitra fusoides Lea, 1833, p. 169, pl. 6, fig. 176; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 42, pl. 16, fig. 8; H. C. Lea, 1848, p. 101; d'Orbigny, 1850, p. 355; Harris, 1895, p. 20.

Conomitra fusoides (Lea) Conrad, 1865, p. 25; Conrad, 1866, p. 16; Tryon, 1882, Man. Conch., p. 109, pl. 3, fig. 41; de Gregorio, 1890, p. 72, pl. 5, figs. 32-38; Cossmann, 1890, Annuaire Géologique Universel, tome VII, p. 997; Cossmann, 1893, p. 38; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 172, pl. 8, fig. 1 [age wrong].

Shell ovato-fusiform, longitudinally and closely ribbed, transversely striate above, furrowed below the suture; substance of the shell rather thick; spire short, rounded at the apex; suture irregularly impressed; whorls six; flattened; mouth linear; columella with four somewhat distant folds; outer

[593]Conrad, T. A., 1865, p. 25.
[594]Dall, W. H., 1915, p. 62.
[595]Tryon, G., Man. Conch., vol. IV, p. 109, 1882; Tryon, G., 1883, p. 170.
[596]Dall, W. H., 1889, p. 163.

lip sharp, within minutely and closely crenate.

Length .4, Breadth .2, of an inch.

Observations.—This pretty little species differs from the two above described, in being much shorter and wider in proportion. It also differs in having transverse striæ above and having a furrow below the suture. The folds are the same in number, but placed higher on the columella, and are more separated from each other. In some specimens the ribbs and transverse striæ are so obsolete as to present an almost perfectly smooth shell. This species very closely resembles the figure of *M. pumila** (Sowerby). It differs in having a transverse furrow, and in the ribs being much stronger than the transverse striæ.—[Lea, 1833].

*Minn. Conch. vol. 5, pl. 430.

The nucleus consists of one and a half smooth whorls, first whorl flat partly immersed, second whorl enlarged. There is considerable variation in the sculpture of this species. Some have the longitudinal and spiral lines about equal in strength giving the shell a slight cancellate appearance. Others have the longitudinal ribs increased in strength with the spiral ribs obscure. Some have the longitudinal ribs strong with the spiral ribs almost obsolete. The sculpture varies over the shell. One type is not confined to an individual. Lea observed the smooth variety of the form to which De Gregorio gave the name *lepa.* In *lepa* the whole surface of shell may be smooth or many specimens may have the upper whorls of the spire with typical markings. The variety is like the typical in other respects.

Lea gave the number of whorls as six. This number includes the whorls of the nucleus.

The descendent of *C. fusoides* in the Jackson is probably *C. jacksonensis* Cooke[597]. It is a more slender form.

Through the courtesy of Miss Helen Winchester, Academy of Natural Sciences, Philadelphia, an illustration of the type of *C. fusoides* is included.

Dimensions.—Height, 10.5 mm.; greatest diameter, 5 mm., lectotype.

Lectotype.—No. 5868, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Conomitra fusoides lepa de Gregorio Plate 66, figs. 23, 27, 28

Mitra (*Conomitra*) *fusoides lepa* de Gregorio, 1890, p. 72, pl. 5, figs. 32-36; Cossmann, 1893, p. 38.

Testa sublaevigata; costis omnino obsoletis.

[597]Cooke, W., Jour. Wash. Acad. Sci., vol. 16, No. 5, p. 134, fig. 6, 1926.

Je considère mes exemplaires comme une variété; car j'ai examiné des individus qui montrent des passages du type à la variété; mais en comparant les limites extrèmes de ceux-ci, c'est à dire les échantillons pourvus de côtes bien développées et les échantillons lisses, on reste frappé de la différence. Néanmoins, le contour, les plis, la forme et tous les caractères principaux restent les mêmes; raison per laquelle on doit référer tous les exemplaires à la même espèce.

Coll. mon Cabinet.—[De Gregorio, 1890].

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Lower Claiborne: locality 734. Gosport sand: locality 104 (type).

Conomitra texana (Harris) Plate 66, figs. 20-22

Turricula (*Conomitra*) *texana* Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 69, pl. 6, fig. 11.

Size and form as indicated in the figure; whorls 5; nuclear whorl obtuse, smooth; other spiral whorls ornamented by longitudinal costæ, and a slight, subsutural depression; body wherl with much more numerous costæ, a slight subsutural depression, surface without a trace of spiral lines and polished; columella 4-plaited, the penultimate the largest; labrum crenulate within.

Localities.—Well at College Sta., Brazos Co.; Alabama Bluff, Trinity River, Houston Co.; Hurricane Bayou, near Crockett, Houston Co.; Collard's farm, Town Branch, Brazos Co., Texas.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

On some individuals the subsutural band becomes pronounced, the longitudinal ribs become nodose with a concave area between the sub-sutural area and the nodes giving the shells a volute appearance.

Dimensions.—Height, 7.5 mm.; greatest diameter, 3 mm.

Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas. Probably lost.

Occurrence.—Lower Claiborne: localities 725, 726, 727, 741 and 743.

Conomitra texana orangeburgensis new variety Plate 66, figs. 12, 15

Shell small; nucleus composed of two whorls, first partly immersed; second large; post-nuclear whorls with large, longitudinal folds, nodose at the mid-line of the whorls of the spire; suture distinct; between the suture and the line of nodes there is a concave area which becomes smoother and more pronounced with age; canal short; 4, strong, columellar plications.

This character of this variety is introduced by the features of certain Texas specimens of *C. texana* in which the longitudinal ribs become nodose and a concave area below the suture develops. The line of variation is carried further in *orangeburgensis* until it suggests that of *Lapparia* . The species may be confused superficially but may be distinguished by the difference in the nuclei of *Conomitra* and *Lapparia*.

The species is fairly abundant in the Orangeburg, S. C. district.

Syntypes.—Nos. 3251 and 3252, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 136 and 707.

Conomitra polita Vaughan Plate 66, fig. 29

Conomitra polita Vaughan, 1896, U. S. Geol. Sur. Bull. 142, p. 35, pl. III, fig. 1 nec *Mitra polita* Reeve, 1844 nec *Fasciolaria polita* Gabb= *Fusimitra polita* (Gabb).

Form and size indicated by figure. Whorls, 6; surface smooth, polished, without longitudinal folds or costæ. Suture slightly impressed; a short distance anterior to it (on body whorl about .5 mm.) is an impressed revolving line. Between this line and the suture below are a few very faint impressed revolving lines. On the body whorl anterior to the line upon which the suture will be located are about 17 distinct impressed revolving lines. Lines of growth indistinct. Inner lip incurved from the posterior termination of the aperture. Columella straight, with four folds; the anterior is much smaller than the others, which are of about the same size.

This species differs from *C. fusoides* Lea, to which it is closely related, by the incurving of the inner lip and the entire absence of longitudinal folds (costæ). The inner lip and columella of *C. fusoides* is straight and although there are smooth varieties of the species, obscure longitudinal folds are nearly always present.

Locality.—Georgetown (Lerch and Vaughan).

Geological horizon.—Lower Claiborne.

Types in collection of the Louisiana geological survey.—[Vaughan, 1896].

This species differs from the smooth variety *lepa* of *C. fusoides* in having more spiral ribbing on the body whorl particularly on the apertural side.

This is not the *Fasciolaria polita* Gabb=*Fusimitra polita*. The illustrations will readily show that the two species belong to distinct groups of the Mitridæ.

C. hammakeri Harris[598] from the Jackson of Arkansas and Louisiana is higher and more slender.

Holotype.—No. 147047[599], United States National Museum,

[598]Harris, G. D., Ann. Rept. Sur. Ark. for 1892, vol. II, p. 163, pl. VI, fig. 4, 1894 as *Mitra*.

[599]Personal communication from Dr. Paul Bartsch. Specimen later examined.

Washington, D. C.

Genus **VOLVARIA** Lamarck, 1801[600]

Genotype by subsequent designation, Children, 1823[601], *Volvaria bulloides* Lamarck. Eocene. Paris Basin.

Volvaria alabamiensis Cossmann Plate 65, figs. 1, 7

Volvaria alabamiensis Cossmann, 1893, p. 49, pl. II, fig. 12; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 181; nec *Volvaria* (*Volvariella*) *alabamensis* Aldrich, 1897; nec Harris, 1899, p. 7=*Volvariella aldrichi* Cossmann, 1899, ibid, p. 182, n. n.

Testa ovoidea, subcylindrica, apice applanato ac paululum involuto, ultimo anfractu totam testam æquante; sulcis spiralibus, regularibus, tenuissime punctatis; labro incurvato; columella antice bi-intorta.

Coquille presque cylindrique, un peu ovale et arrondie du côté du sommet qui est aplati, tronqué et presque totalement involvé; on n'aperçoit que deux tours embryonnaires, lisses, sans aucune saillie; le dernier tour forme, à lui seul, toute la coquille; il est orné de sillons spiraux, plus serrés en arrière, s'écartant règlièrement davantage du côté antérieur qui est ovalement atténué; ces sillons sont finement ponctués par les accroissements. Ouverture étroite, à bords parallèles, labre un peu incliné et curviligne, fortment entaillé à la suture; échancrure antérieure profonde; columelle deux fois tordue sur elle même en avant; le pli inférieur s'enroule obliquement autour de la torsion antérieure qui est presque verticale.

Dim.: Longueur, 9 mill., diamètre 3 mill.

Cette rare espèce, dont je ne possède que deux individus à peu près complets, se distingue de celles du bassin de Paris par ses plis columellaires moins rombreux, et par la forme de son sommet.

Loc.: Claiborne (pl. II, fig. 12) ma coll.—[Cossmann, 1893].

Holotype.—Laboratorie de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Occurrence.—Gosport sand: locality 104.

Volvaria gabbiana Harris Plate 65, fig. 2

Marginella (*Volvaria*) *gabbiana* Aldrich, MS., pl. 2, fig. 13 fide Harris, 1895.

Volvaria gabbiana Harris, 1895, April, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 67, pl. 6, fig. 7.

Volvaria bulloides Aldrich, 1895, June, Bull. Amer. Pal. vol. I, No. 2, p. 5, pl. 2, fig. 13.

Size and general form as shown by the figure; whorls 3; 1, smooth; 2, spirally striate; body whorl long cylindrical, spirally striate with faint punctations in the striæ; labrum sharp-edged; labium with four basal folds varying in size as follows: at base a moderate sized fold, above, a stronger one, still above, a moderate sized one, and above all, a very faint one.

Localities.—Devil's Eye, Colorado River, Bastrop Co.; bluff just below the mouth of Alum Creek, Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

[600]Lamarck, J. B., 1801, p. 93.

[601]Children, J. G., 1823, p. 63 in Kennard, A. S. and others, 1931, p. 33.

The holotype of Prof. Harris's specimens was formerly in the Geology Department, University of Texas, Austin, Texas. It is probably lost.

Volvaria reticulata Johnson Plate 65, figs. 5, 11, 16

Volvaria reticulata Johnson, 1899, Acad. Nat. Sci. Phila., Proc. vol. 51, p. 71, pl. 1, fig. 1.

Shell cylindrical, spire prominent, whorls five, the three apical whorls smooth, the body and adjoining whorl reticulated by numerous, raised, revolving and longitudinal lines, the revolving lines equidistant, while the longitudinal ones, which represent lines of growth, are finer and irregular; columella with two moderate folds. Length 7½ mm., greatest diameter 3 mm.

One specimen collected by the writer, from the Lower Claiborne at Moseley's Ferry, Brazos river, Burleson Co., Texas.—[Johnson, 1899].

Three specimens from loc. 741, Louisiana have the characteristic sculpture of the species described from Moseley's Ferry, Texas. The Louisiana specimens do not have so straight sides as typical *reticulata*. *Reticulata* has an apical angle of 60° while the specimens from loc. 741 have an apical angle of 80°. Without specimens of *reticulata* for further comparisons, a varietal name is not given.

Holotype.—No. 6467, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality 741.

Genus VOLVARIELLA Fischer, 1883[602]

Genotype by monotypy *V. lamarcki* Desh. Eocene. Paris Basin.

Volvariella aldrichi Cossmann Plate 65, figs. 3, 4

Volvaria (Volvariella) alabamensis Aldrich, 1897, Bull. Amer. Pal. vol. II, No. 8, p. 13, pl. 2, fig. 3; Harris, 1899, ibid, vol. III, No. 11, p. 7, pl. 1, fig. 7 non *V. alabamensis* Cossmann, 1893.

Volvariella aldrichi Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 182.

The holotype and one other specimen came from the Sabine Eocene. A Claibornian specimen measures 7 mm., in height. The characters of the latter are identical with the illustration of the type. The species differs from the lower Claiborne form *Volvaria gabbiana* Harris (Ald. MS.) in having only two columella folds and in having a higher spire.

Dimensions.—Height, 6.5 mm.; greatest diameter, 2.5 mm.,

[602]Fischer, P., Man. de Conch., p. 553, 1883.

holotype. Height, 8.5 mm., greatest diameter, 4 mm., Aldrich topotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Sabine Eocene. (type). Gosport sand: locality 104.

Genus **MITROLUMNA** Bucquoy, Dautzenberg and Dollfus, 1882[603]

(*Clinomitra* and *Diptychomitra* Bellardi, 1888.)

Genotype by original designation, *Mitra olivoidea* Cantraine, 1834(=*M. columbellaria* Scacchi). Living. Mediterranean.

Cossmann[604] united *Clinomitra*[605] and *Diptychomitra*[605] with the earlier described genus *Mitrolumna*. The characteristic feature of the three groups is the biplication of the columella. *Mitrolumna* and *Clinomitra* represent smooth or nearly smooth species while the species of *Diptychomitra* are finely but completely sculptured.

The Claiborne species *Mitromorpha eocenensis* Aldrich belongs to the *Diptychomitra* group. *D. eximia* Bellardi of the middle Miocene of Italy is herewith designated as the type of *Diptychomitra* Bellardi in case such forms prove to be a distinct group.

Mitrolumna eocenensis (Aldrich) Plate 66, figs. 4-6

Mitromorpha eocenensis Aldrich, 1908, Nautilus, vol. XXII, No. 2, p. 13, text fig.

Shell small, but five whorls remaining (the embryonic whorls are broken off), sulcate, the longitudinals close set and prominent, the spirals the same on the smaller whorls, but on the body whorl more prominent at the suture and the base; suture distinct and rather deep; outer lip denticulated; pillar lip with two tubercles, the one nearest the the canal long and tapering. Canal short, slightly widened and slightly twisted.

Length 7 mm., breadth 3 mm.

Locality.—Claiborne Sand Bed, Claiborne, Alabama.

Remarks.—In *Mitromorpha pygmæa* Dall and others examined, the spiral sculpture seems to predominate, but in the species described above the longitudinal is the stronger.—[Aldrich, 1908].

Shell small; nucleus destroyed on the three specimens of the

603Bucquoy, E., Dautzenberg, Ph. and Dollfus, G. F., 1882, p. 121.

604Cossmann, M., Essais Pal. Comp., 3 liv., p. 174, 1899.

605Bellardi, L., I Moll. dei terreni terz. del Piemonte e della Liguria, pt V. [Mitridæ fine], p. 10, 1888. *Clinomitra* monotype *C. Rovasendae* Bell. *Diptychomitra* several species, no type designated.

collection as well as on the holotype; slender in shape, the sides of the shell convex with the convexity equal above and below the mid-line; there is a more pronounced, spiral cord just below the suture; surface sculptured with prominent, longitudinal ribs which cross finer, spiral cords; the longitudinal ribs die out on the lower portion of the body whorl and the spiral ribs become more strongly developed; aperture elongate; canal short; labrum crenate within; labium with heavy denticles.

This species might be taken for a *Conomitra* or *Uromitra* but differs in the character of the denticles or plications on the inner lip. The species is more slender than any of the species of Mitroid forms it is associated with.

This species does not belong to *Mitromorpha*[606] as that genus is now understood.

Dimensions.—Height, 4+ mm.; greatest diameter, 2 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: locality 104.

Excluded Species

Mitra biconica Whitfield, 1865, Amer. Jour. Conch., vol. I, p. 263; Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour., vol. X, p. 80 is a *Turrid.* It is discussed and illustrated in Harris, 1937, Paleontographica Americana, vol. II, No. 7, p. 61, *Cordieria biconica.*

Family MARGINELLIDÆ

Genus MARGINELLA Lamarck, 1799[607]

Genotype by monotypy *Voluta glabella* Linnæus. Living. Western Africa.

Marginella constrictoides Meyer and Aldrich Plate 67, figs. 2, 7, 12

Marginella constrictoides Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour., vol. 9, p. 44, pl. 2, fig. 10; Dall, 1890, p. 57; Cossmann, 1893, p. 39.

Marginella constrictoides Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 88 section *Eratoidea* Weinkauff.

Biconical. Spire more than a third the length of the shell. Whorls six, flattened. Columella, with four folds, the uppermost nearly horizontal,

[606]Iredale, T., Proc. Mal. Soc. Lond., vol. XII, p. 328, 1917; Woodring, W. P., 1928, p. 249.
[607]Lamarck, J. B., 1799, p. 70.

the lowest nearly vertical. Aperture straight. Outer lip thickened, crenate. Newton.

Marginella constricta Conr. from Claiborne is similar; but has the outer lip angular posteriorly, five plaits on the columella, which are besides of different shape and position, has a lower spire and is smaller.—[Meyer and Aldrich, 1886].

The author does not see differences enough between this species and *M. glabella,* the type of *Marginella* sensu stricto to warrant putting the species in a subgroup.

Dimensions.—Height, 10 mm.; greatest diameter, 5 mm.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Newton, Miss. (type); localities: 723, 725, 726, 728, 729, 730, 731, 734, 747 and 803.

"Marginella" constricta Conrad Plate 67, fig. 3

Marginella constricta Conrad, 1835, p. 46, pl. 16, fig. 15; Conrad, 1834, App. in Morton, p. 5; d'Orbigny, 1850, p. 351; Conrad, 1866, p. 16; Conrad, 1870, Amer. Jour. Conch., Vol. VI, p. 78; Redfield, 1871, Amer. Jour. Conch., vol. VI, pp. 219, 262; de Gregorio, 1890, p. 62, pl. 4, fig. 48 subgenus *Glabella;* Dall, 1890, p. 57; Cossmann, 1893, p. 39; Harris, 1895, p. 12; nec *M. constricta* Hinds, 1844, nec *M. constricta* Emmons, 1858.

Erato ? constricta Conrad, 1865, p. 25.

Marginella constricta Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 88 section *Eratoidea* Weinkauff.

Narrow, somewhat elliptical; spire rather elevated, pointed; columella with 3 plaits; labrum acutely angular above.

Locality.—Claiborne, Alab. Extremely rare.—[Conrad, 1835].

The specimen in the Academy of Natural Sciences which is now labelled type of this species is the shell which apparently Conrad had in 1870 when he stated the species had 5 plaits. Meyer drew a specimen which he thought was the type. That shell has 3 plaits but it does not coincide with Conrad's figure of the species. The specimen labelled type at present is *M. columba* Lea.

Type.—Probably lost.

Section EURYENTOME Cossmann, 1899.[608]

Genotype by original designation *M. crassilabra* Conrad=*M. silabra* Palmer non *M. crassilabra* Lea. Eocene. United States.

Marginella silabra, new name Plate 67, figs. 4, 9; Plate 89; fig. 10

non *Marginella crassilabra* Bory de St. Vincent, 1827, Exp. Tab. Encyp.

[608]Cossmann, M., Essais Pal. Comp., 3 liv., p. 95, 1899.

Meth. Vers., I, p. 167, pl. 377, fig. 7 fide Tomlin, 1917, Proc. Mal. Soc. Lond., vol. XII, p. 260.

Marginella crassilabra Conrad, 1833, Sept., p. 33; Conrad, 1835, p. 45, pl. 13, fig. 13; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 101; d'Orbigny, 1850, p. 351; Conrad, 1866, p. 16; Redfield, 1871, Amer. Jour. Conch., vol. VI, pp. 219, 262; Dall, 1890, p. 57; Cossmann, 1893, p. 39 [partim]; Harris, 1895, p. 13; nec *M. crassilabra* Lea, 1833, Dec.=*M. columba* Lea, 1833; nec *M. crassilabrum* Sowerby, 1846 nec Reeve, 1865.

Marginella anatina Lea, 1833, Dec., p. 176, pl. 6, fig. 186; H. C. Lea, 1848, p. 101; Harris, 1895, p. 5.

Porcellana crassilabra Conrad, 1854, Acad. Nat. Sci. Phila., Proc. vol. VII, p. 31.

Erato crassilabra Conrad, 1865, p. 25.

Marginella (*Cryptospira*) *crassilabra* (Conrad) de Gregorio, 1890, p. 60, pl. 4, figs. 23, 24.

Cryptospira crassilabra (Conrad) Cossmann, 1893, Essais Pal. Comp., 3 liv., p. 95, pl. IV, figs. 9-10 section *Euryentome*.

Shell smooth, thick; spire elevated; varix on the outer lip very thick and extending upon the spire; lip crenulated on its inner edge; nine or ten teeth on the columella. Length less than ½ an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Subovate, thick, spire slightly elevated; suture indented and margined beneath by a prominent line; apex obtuse; varix on the outer lip very thick and extending upon the spire; lip with very numerous crenulations within, columella with 9 or 10 folds.

Syn. M. anatina, *Lea, Con. p.* 176, *pl.* 6, *f.* 186.

Locality.—Claiborne, Alab.

The whorls of this species are slightly flattened above, and the deposit on the spire is also continued widely over the labium; the folds cover a great portion of the columella, and the superior ones are slightly deflected. No. 3, first ed. p. 33.—[Conrad, 1835].

The nucleus is smooth, highly polished, consists of about two whorls with the suture indistinct. The nucleus is typical of *M. glabella,* the type of the genus. A young specimen 5 mm. in height has the characters of the adult developed with the exception of the spread of the callus over the spire and broadly over the face of the body whorl. Nor does it have a deeply cut posterior canal.

The lower four plications are large, the fifth is medium in size, usually not so well developed as the lower four. The upper four or five are smaller, i. e. low. They may or may not extend in length so far as the other plications. Specimens of this species of the same size as adult *M. columba* Lea show the difference in number and character of the plications from that species. This species attains a larger size than *M. columba* and has a relatively higher spire. It is not so abundant as *M. columba.*

The elevated spire, callus of the labrum and the character of the anterior canal are typical of *Marginella* s. s. The spread of the callus over the spire and labium with the deep, posterior sinus and additional plications characterize the section. The callus of *M. silabra* is like that of the Recent species *M. limbata* Lamarck in Reeve.

Cossmann and De Gregorio placed the species in *Cryptospira* Hinds, making *Cryptospira* of generic rank. The status of *Cryptospira* is not clear. *Cryptospira* was used by Hinds[609] originally as one of two divisions of the Marginellas and not in the generic sense. *M. tricincta* Hinds and *M. blanda* Hinds were the two species given by Hinds under the term. H. and A. Adams used *Cryptospira* in 1858 as a subgenus but did not designate one of the 17 species which they included under the name, as type. Harris designated *Marginella tricincta* Hinds as type in 1897[610]. This would be a valid designation if the name can be used generically. Cossmann, 1899, gave *M. quinqueplicata* Lam. as the type of *Cryptospira* Hinds. This is not a valid designation of type as that species was not included in Hinds' description. The species was included among the species of H. and A. Adams. In such a case the subgenus is not of Hinds. As far as the Clairbornian species are concerned the author does not believe they belong to *Cryptospira* Hinds of the possible designations. The nomenclature of *Cryptospira* is yet to be established.

Dimensions.—Height, 14 mm.; greatest diameter, 9 mm., lectotype. Height, 11 mm.; greatest diameter, 7 mm., lectotype *M. anatina* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5888, A. N. S. lectotype *M. anatina* Lea.

Occurrence.—Gosport sand: locality 104.

Section **LEPTEGOUANA** Woodring, 1928[611]

Type by original designation *Voluta guttata* Dillwyn. Living. Florida and West Indies.

Woodring suggested that *Leptegouana* might be similar to *Microspira* Conrad, 1868[612]. Conrad does not speak of a parietal

[609]Hinds, R. B., Zoology, Voy. Sulphur, Mollusca, vol. 2, p. 46, 1844; Hinds, R. B., Zool. Soc. Lond., Proc. pt. XII, p. 76, 1844.
[610]Harris, George F., 1897, p. 90.
[611]Woodring, W. P., 1928, p. 237.
[612]Conrad, T. A., Amer. Jour. Conch., vol. IV, p. 66, pl. 5, fig. 3, 1868.

callus extending over a portion of the spire nor does the illustration show much of a parietal callus.

Marginella columba Lea

Plate 67, figs. 1, 6, 15, 20; Plate 89, figs. 7, 14; Plate 90, fig. 16

Marginella columba Lea, 1833, p. 177, pl. 6, fig. 187; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 45, pl. 16, fig. 16; H. C. Lea 1848, p. 101; d'Orbigny, 1850, p. 351; Redfield, 1871, Amer. Jour. Conch., vol. VI, p. 262; Dall, 1890, p. 56.

Marginella crassilabra Lea, 1833, Dec., p. 177, pl. 6, fig. 188; H. C. Lea, 1848, p. 101; Harris, 1895, p. 14; nec *M. crassilabra* Bory de Vincent, 1927; nec Conrad, 1833, Sept., nec Sowerby, 1846; nec Reeve, 1865.

Marginella humerosa Conrad, 1835, p. 45, pl. 16, fig. 14; Conrad, 1834, App. in Morton, p. 5; Conrad, 1865, p. 25 as *Erato;* Conrad, 1866, p. 17; Redfield, 1871, Amer. Jr. Conch., vol. VI, p. 264.

Marginella incurva Lea, 1833, p. 179, pl. 6, fig. 192; H. C. Lea, 1848, p. 101; de Gregorio, 1890, p. 62, pl. 4, figs. 45-47.

Marginella (*Cryptospira*) *columba* (Lea) de Gregorio, 1890, p. 60, pl. 4, figs. 25, 49.

Marginella (*Cryptospira*) *humerosa* (Conrad) de Gregorio, 1890, p. 61, pl. 4, figs. 26-30.

Marginella crassilabra (Lea) Cossmann, 1893, p. 39 [partim].

Marginella americana Conrad, 1845, Fos. Med. Tert., p. 86, pl. 49, fig. 12; Redfield, 1871, Amer. Jour. Conch., vol. 6, p. 261; Dall, 1890, pp. 52, 56 fide Dall.

Shell ovate, smooth, substance of the shell thick; suture scarcely perceptible, spire somewhat elevated, conical; whorls ———, slightly convex; columella with five folds; mouth narrow, straight; outer lip much thickened, crenulate within.

Length 7-20th, Breadth .2, of an inch.

Observations.—Like the last described, a single individual only of this species came into my possession. In outline they resemble each other. The *columba* has not, however, any deposit or coating—it has a higher spire and a less number of folds. The folds too are different in the latter, having the appearance of being formed by the grooving of the columella, while in the *anatina* they are placed on the columella.—[Lea, 1833].

The nucleus consists of about two whorls, smooth and polished. Suture indistinct. The young shells have the spire elevated as in the adult, the four plications are strongly developed. The labrum is not thickened and the callus is not developed. *M. incurva* of Lea represents a young stage of the species before the outer lip has thickened. Occasionally a specimen of *M. columba* occurs which has a fifth, weak plication on the columella posterior to the four regular plications. Such a specimen was the type of *M. columba* Lea. Lea stated that he had a single specimen. *M. crassilabra* Lea not Conrad and *M. humerosa* of Conrad represent the normal form. Unfortunately the name *Marginella crassilabra* was used by both Lea and Conrad for different forms. The name has been used by other authors for different species. The first name applied to the Claibornian species was *M. columba* by Lea. *Columba* is therefore used to cover the species.

There are normally and commonly four folds on the columella. In some cases the fifth plication may be seen better by breaking back the outer lip. Sometimes a fine row of bead-like structures occurs on the upper portion of the labium. Lea has given the distinction between *M. columba* and his *anatina=silabra*.

M. columba is abundant in the Gosport sand at Claiborne.

M. incurva Jacksonensis Meyer[613] has hardly an adequate description. *M. incurva* being probably an immature form of *columba*, it is difficult to say how close the Jackson specimens Meyer had are to *columba*. Research on the Jackson Eocene fauna will probably reveal the identity of *jacksonensis*.

Dimensions.—Height, 9 mm.; greatest diameter, 5.5 mm. lectotype *M. columba* Lea. Height, 9 mm.; greatest diameter, 6 mm. *M. crassilabra* Lea. Height, 6.5 mm.; greatest diameter, 4 mm. *M. incurva* Lea.

Lectotype.—No. 5889, Academy of Natural Sciences, Philadelphia, Pa. No. 5890, A. N. S., *M. crassilabra* Lea. *C. humerosa* Conrad, A. N. S., 8 specimens, lectotype not selected. No. 5907, *M. incurva* Lea, A. N. S.

Occurrence.—Gosport sand: locality 104.

Genus PERSICULA Schumacher, 1817.[614]

Genotype by monotypy *Voluta persicula* Linnæus=*P. variabilis* Schumacher. Living. West Africa.

Subgenus BULLATA Jousseaume, 1875[615]

(*Volutella* Swainson, 1840 nec Perry, 1811 nec d'Orbigny, 1840.)

Genotype by absolute tautonymy *Bullata bullata* (Born)= *Voluta bullata* Born. Living. Brazil.

Persicula (Bullata) larvata (Conrad) Plate 67, figs. 21-23; Plate 89, fig. 13

Marginella larvata Conrad, 1833, Sept., p. 33; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 45, pl. 6, fig. 12; H. C. Lea, 1848, p.

[613] Meyer, O., Amer. Jour. Sci., vol. 29, p. 465, 1885.
[614] Schumacher, C. F., 1817, p. 235.
[615] Jousseaume, F., Revue et Mag. Zool. ser. 3, vol. 3, 38th year, p. 250, 1875.

101; d'Orbigny, 1850, p. 351; Redfield, 1871, Amer. Jour. Conch., vol. VI, p. 265; Dall, 1890, p. 57, Cossmann, 1893, p. 40; Harris, 1895, p. 24.

Marginella ovata Lea, 1833, Dec., p. 179, pl. 6, fig. 191 non *M. ovata* Emmons, 1858.

Porcellana larvata Conrad, 1854; Acad. Nat. Sci. Phila., Proc. vol. VII, p. 31.

Volutella larvata Conrad, 1865, p. 25; [partim]; Conrad, 1866, p. 16; de Gregorio, 1890, p. 61, pl. 4, figs. 34-37 *Marginella*.

Marginella (*Cryptospira*) *ovata* (Lea) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 96, pl. III, fig. 26 section *Gibberula*.

Shell smooth, thick, spire obsolete; with from six to eight teeth on the columella. Length ¾ of an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Ovate, thick, gibbous above on the labrum; spire obsolete; labrum without a varix, margin acute.

Syn. M. ovata, M. semen, (*young*) *Lea, Con. p.* 178, *pl.* 6, *f.* 190, 191. Oliva minima? *f.* 200.

Locality.—Claiborne, Alab. No. 3, first ed. p. 33.—[Conrad, 1835].

A discussion is given under *B. semen* of the differences between the young of this species and that of the young or adult of *B. semen*. As stated there, *B. semen* is probably not the young of *B. larvata* as has been given by Conrad and followed by Redfield.

Most of the adults have the spire with apex completely covered, some have the apex protruding like a minute button. The outer lip is thickened but the thickening begins at a distance from the margin and the peripheral, overturned thickness is narrow. Usually the inner margin of the outer lip is not crenated but this is not a constant character as some specimens are decidedly crenated. The anterior basal notch is deep. The plications vary from eight to ten. Young specimens have eight to nine plications. *Bullata larvata* is the largest of the Clabornian Marginellas.

Because this species compares so closely in character with *B. bullata* (Born), the type of *Bullata* Jousseaume, it is placed in that subgroup of Marginellidæ. The concealment of the spire is typical. Specimens of *B. bullata* show a variation in the crenulation of the inner surface of the outer lip. It is smooth on some specimens but some show crenulations. The character by which *B. larvata* varies from type is in the basal notch. In *B. larvata* it has about twice the depth of *B. bullata*.

Kellum[616] compared molds from the Castle Hayne Jackson Eocene beds of North Carolina with *larvata.*

Dimensions.—Height, 20 mm.; greatest diameter, 12 mm., lectotype *M. larvata.* Height, 14.5 mm.; greatest diameter, 8.5 mm., lectotype *M. ovata* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5903, A. N. S., lectotype *M. ovata* Lea.

Occurrence.—Lower Claiborne: localities 726, 728, 729, 730, 731 and 803. Gosport sand: locality 104 (type).

Persicula (Bullata) semen (Lea)

Plate 67, figs. 13, 14, 16-19; Plate 90, fig. 15

Marginella semen Lea, 1833, p. 178, pl. 6, fig. 190; H. C. Lea, 1848, p. 101; Meyer, 1885, Amer. Jour. Sci., vol. 29, p. 468; Dall, 1890, pp. 55, 57; Cossmann, 1893, p. 40; Harris, 1895, p. 41; non *M. semen* Reeve 1865.

Marginella semen (young) (Lea) Conrad, 1835, p. 45 under *M. larvata.*

? *Marginella* sp. Conrad, 1870, Amer. Jour. Conch., vol. VI, pl. 3, fig. not numbered, no name or description.

Marginella ovata Emmons, 1858, Geol. Sur. N. Car., p. 261, fig. 136 non *M. ovata* Lea, 1833.

Marginella (*Volutella*) *semen* (Lea) de Gregorio, 1890, p. 62, pl. 4, figs. 38-44 including varieties.

Marginella (*Cryptospira*) *semen* (Lea) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 97 section *Gibberula.*

Shell ovato-elliptical, polished; substance of the shell rather thick; spire very short and rounded at the apex; whorls three, flattened above; columella with six folds; mouth narrow, curved; outer lip somewhat thick and very minutely crenulate within.

Length 5-20th, Breadth 3-20th, of an inch.

Observations.—This species seems most analogous to the last described, but is without its exterior folds, and is more elliptical.—[Lea, 1833].

The adults of the various species of the Eocene Marginellas have characters which differentiate the species fairly easily. The young of the species show a general stock from which the forms were derived. When one has a collection as the Gosport sand where hundreds of specimens of the same genus are mixed, with the specimens representing the young and adults of different species it is difficult to find a character which consistently separates the forms. If one cannot find characters which separate the individuals of different stages of growth it does not seem that the forms are good species. It is with such a point of view that when the Claibornian Marginellas are examined one is at first inclined to agree with Conrad that *M. semen* Lea is the young of

[616]Kellum, L. B., U. S. G. S. Prof. Paper, No. 143, p. 30, pl. V, fig. 18, 1926.

M. larvata Conrad. But on examining all the specimens carefully one is able to differentiate the forms practically on the number of plications in the young stages of all, even when the shape is almost constant. However, when considering the variations of *M. semen* there is still doubt as to the proper classification and there is an intimation that they all may be the young of *larvata*.

M. columba Lea throughout its life history has four, well-developed plications with a fifth less developed. *B. semen* Lea has six plications with frequently a seventh plication. *B. larvata* Conrad has eight to ten plications. Specimens of young of *B. semen* only 3 mm. in length show the six and seven plications. In both the young and adult of *B. larvata* the greater number of plications are well developed. The plications above the sixth or seventh may be finer.

B. semen does not attain the large size of the other species with which it occurs. It and *B. plicata* range about the same size. *B. plicata* Lea has six plications but it may be distinguished from *B. semen* by the absence of plications on the upper margin of the body whorl. Many specimens of *B. semen* show dark colored, spiral bands. Dr. Dall called attention to this feature of the species. These coloration bands seem to be structural because on weathered specimens where the outer layer of shell has been peeled off spiral ridges remain in the position of the coloration bands on the surface. There are seven of these spiral bands and subsurface ribs. Three of the surface bands are more distinct than the others. See pl. 67, fig. 17.

B. semen apparently represents the general stock from which the various forms were derived. Dr. Dall[617] reported the species as occurring in the Miocene of North Carolina. This probably refers to the Emmons specimen of *ovata*.

The question of the status of *B. semen* and its variation is made difficult because *B. semen* occurs abundantly associated with the other species of *Marginella* in the Gosport sand. Where the adults and young of similar forms are together stratigraphically it is hard to distinguish which is the young of each. Fortunately shells of *B. semen* occur in the Jackson Eocene where they are not associated with shells of *B. larvata* and *plicata*. This is

[617]Dall, Wm. H., 1890, p. 55.

one of the strongest reasons for believing that *B. semen* is a distinct species. In the Jackson *B. semen* has a shape typical of the Gosport sand. It has 6-7 plications on the columella and the labrum is either smooth or crenate. This is as the species occurs typically in the "sand". There occurs however a form of *semen* in the "sand" which differs in shape from the typical. The spire is not as elevated but is pointed and the width of the body whorl posteriorly is narrower and the labrum slopes straighter from the posterior line. The number of plications is the same but the labrum is narrower and may be either smooth or crenate within. This form of *semen* Lea called *Oliva minima*. The same variety De Gregorio named *linda*.

Another variation of *semen* occurs which is like *minima* in shape with a smooth, inner margin of the labrum but there are only 4-5 plications on the columella. This form De Gregorio called *propenitidula* with *exilarata* for the same form with crenulations on the external border, although he figured *exilarata* with a smooth labrum. The inner margin of the labrum of *B. larvata* may be crenulated or smooth. Such a condition exists on shells with typical *larvata* characters, i. e., shells with 8-10 plications on the columella. *B. semen* and *B. minima* vary throughout as to a smooth or crenated inner margin of the labrum. Hence one does not believe such a character worthy of even varietal division. De Gregorio's *exilarata* and *propenitidula* are therefore united.

The young of *B. larvata* has 8-9 plications on the columella with a smooth inner margin of the labrum. The adult of *larvata* has 8-10 plications and the inner margin of the labrum is crenated or smooth. The shape of the young which compares in size to *semen* and its varieties is like *minima*. If the number of plications of *larvata* is not constant and there may be in the young, fewer plications, then that which is called *semen*, particularly *minima* would be merely immature *larvata*. The shape of adult *larvata* is fairly constant. It hardly seems that the young would exhibit such a variation. For practical purposes it is more convenient to limit *larvata* to those forms, young and adult, which have 8-10 plications, and limit *semen* including its varieties to the forms with 5-7 plications. The biological relations are still open to question.

B. semen s. s. and *B. plicata* have a similar shape and the same number of plications. The distinction between the two is made by the longitudinal folds on the body whorl of *plicata.* Worn specimens with the folds obscure of *plicata* might be easily confused with *semen.* *B. larvata, semen,* and *plicata* seem to be related and hence they are retained in the same genus and subgenus. *B. larvata* is the most typical of the genus because the adults have the spire wholly concealed.

Dimensions.—Height, 6.5 mm.; greatest diameter, 4 mm., lectotype *M. semen* Lea. Height, 3.5 mm.; greatest diameter, 2 mm., *M. semen* (Lea) Conrad(=young *M. semen*) specimen A. N. S.

Lectotype.—No. 5900A, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707, 708, 729, 731 and 734. Gosport sand: locality 104 (type). Jockson Eocene.

Persicula semen minima (Lea) Plate 67, fig. 10; Plate 90, fig. 10

Oliva minima Lea, 1833, p. 184, pl. 6, fig. 200; de Gregorio, 1890, p. 53, pl. 3, fig. 68; Harris, 1895, p. 28 yg. *Marginella.*

Shell ovate, substance of the shell thin; spire snort and obtuse; whorls four, rather convex above, columella with about six equidistant folds extending high up; mouth long, narrow and curved, being four fifths the length of the shell.

Length .2, Breadth .1, of an inch.

Observations.—This very small species differs from those above described, in the spire being short and obtuse, and in having folds which are nearly transverse, and occupy almost the whole of the left side of the mouth.—[Lea, 1833].

Dimensions.—Height, 5.5 mm.; greatest diameter, 2.5 mm., lectotype *M. minima* Lea.

Lectotype.—No. 5927, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Persicula (Bullata) semen exilarata (de Gregorio) Plate 67, fig. 11

Marginella (*Volutella*) *semen exilarata* and *propenitidula* de Gregorio, 1890, p. 62 pl. 4, figs. 42-43 *esilarata.* Spelled *exilarata* twice in explanation of plates *exilarata* in text once, *esilarata* in text once.

Ordinairement dans la *M. semen* il y a 6 plis; dans cette variété il y en a 5, dont la première est moins dévelopée que les autres et presque pas visible.—[De Gregorio, 1890].

Dimensions.—Height, 6 mm.; greatest diameter, 4 mm.

Holotype.—De Gregorio home, Vio Molo 132, Palermo, Sicily.
Occurrence.—Gosport sand: locality 104.

? **Persicula (Bullata) semenoides** (Gabb) Plate 89, fig. 16

Erato semenoides Gabb, 1860, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 383, pl. 67, fig. 49.
Marginella semen Heilprin, 1891, p. 397 [partim].
Marginella semenoides (Gabb) Dall, 1890, p. 57; Schilder, 1933, Mal. Soc. Lond., Proc., vol. XX, pt. V, p. 271 Marginellidæ.

Ovoid, whorls about three, spire very low, mouth linear, narrow, inner lip with a number of large teeth; outer lip very much inverted so as to resemble in an old specimen a nearly perfect Cypræa, finely crenulated inside, anterior emargination deep.

Dimensions.—Length .15 in., greatest width .09 in.

Resembles closely *E. semen*, (*Marginella semen* Lea,) but can be distinguished by its size, being not as large by one-third.

Locality—Caldwell Co., and Wheelock, Texas.

This species has never been found at Claiborne, nor has *E. semen* yet been seen from the Texan strata.—[Gabb, 1860].

Specimens of this species have not been found in the Harris collection. Prof. Harris in his Texan monograph manuscript stated that "this species resembles the preceding *B. semen* Lea in size and general form but is distinguished by its semispherical or dome-like spire. The whorls of *semen* are flattened above and the spire is more elevated."

Gabb's type collection consists of 3 specimens from Wheelock, Texas. The shape varies with age. Anteriorly it is contracted and the posterior is more convex than *B. semen*. The callus is strong. It spreads over the columella and over and above the parietal area.

Gabb's distinction of the size of the two species is only valuable if one knew specimens of the same age had been compared.

Dimensions.—Height, 3 mm.; greatest diameter, 2.5 mm., lectotype.

Lectotype.—No. 13275, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 723, 725, 727 and 743.

Persicula (Bullata) plicata (Lea) Plate 67, figs. 5, 8

Marginella plicata Lea, 1833, p. 178, pl. 6, fig. 189; H. C. Lea, 1848, p. 101; Dall, 1890, p. 57; Cossmann, 1893, p. 40; Harris 1895, p. 35.
Marginella (*Volutella*) *plicata* (Lea) de Gregorio, 1890, p. 61, pl. 4, figs. 31-33.
Marginella (*Cryptospira*) *plicata* (Lea) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 97 section *Gibberula*.

Shell ovate, longitudinally folded above; substance of the shell rather thick; spire short, rounded at the apex; whorls three, flattened above; columella with six folds; mouth narrow, curved; outer lip thick, finely crenulated within.

Length 5-20th, Breadth 3-20th, of an inch.

Observations.—Differs from all the species herein described, in having longitudinal folds, which are placed on the superior part of the whorls.—[Lea, 1833].

The nucleus is obscure, the parietal callus spreads over a portion of the spire. The longitudinal folds of the body whorl occur in young specimens as well as on adults. The folds vary in strength on different individuals. The distinguishing characters of the young of the Claibornian species is discussed under *B. semen*. *B. plicata* differs from the other species of the Claibornian by the presence of longitudinal folds on the body whorl of *plicata*. The form remains small in size.

Because *B. plicata* is like *Bullata* in characters except in the presence of longitudinal folds and in the less submerged spire, the species is retained in that subgenus. The longitudinal ribs are suggestive of the subgenus *Glabella* Swainson[618] of *Marginella*. The ribs on *plicata* are not on the spire of the shell as in *Glabella* and the spire is not elevated but nearly all concealed which places the species in *Persicula* instead of *Marginella*.

Dimensions.—Height, 5.5 mm.; greatest diameter, 4 mm.

Lectotype.—No. 5898, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Excluded Species

Marginella biplicata Lea, 1833, p. 201, pl. 6, fig. 216 is *Ringicula biplicata*.

Family **OLIVIDÆ**

Genus **ANCILLA** Lamarck, 1799[619]

(*Ancillaria* Lamarck, 1811)

Genotype by monotypy "*Voluta* . . . . . Martin, conch. 2, p. 359, t. 65, f. 722-724"=*Voluta ampla* Gmelin[620]. Living. Indo-Pacific.

[618]Swainson, Wm., 1840, p. 324. Type by subsequent designation, *Voluta faba* Linnæus, Gray, J. E., 1847, p. 142.

[619]Lamarck, J. B., 1799, p. 70.

[620]Gmelin, J. F., Systema Naturæ, XIII ed., pars VI, p. 3467, 1792.

The elimination of *Ancilla* Lamarck, 1799 by Vokes[621] and the use of *Ancilla* Lamarck, 1801 which has a different type seems unnecessary. *Ancilla* Lamarck, 1799 was based on an explicit monotypic reference to a species which Gmelin had named *Voluta ampla* based on the same reference. *Voluta ampla* Gmelin therefore becomes the monotype of *Ancilla*. This deduction is in accordance with the personal opinion of Drs. C. W. Stiles[622], P. Bartsch and H. A. Rehder.

Section **OLIVULA** Conrad, 1832[623]

Genotype by subsequent designation Cossmann, 1899[624]. *Ancillaria staminea* Conrad. Eocene. United States.

Ancilla staminea (Conrad) Plate 68, figs. 7, 9, 11

Ancillaria staminea Conrad, 1832, p. 25, pl. 10, fig. 5 proposed *Olivula* but did not designate type; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 96; Harris, 1895, p. 42.

Ancyllaria staminea d'Orbigny, 1850, p. 352.

Anaulax staminea Conrad, 1857, Acad. Nat. Sci. Phila., Proc. vol. IX, p. 166.

Olivula staminea Conrad, 1865, p. 22; Conrad, 1866, p. 17; Tryon, 1883, Struct. and Syst. Conch., vol. II p. 177 pl. 56 fig. 72; Tryon, 1883, Man. Conch., vol. 5, p. 61, pl. 3, figs. 24, 25; Cossmann, 1893, p. 41.

Ancilla (*Olivula*) *staminea* de Gregorio, 1890, p. 57, pl. 4, figs. 5-8; 17-18; Cossmann, 1899, Essais Pal. Comp., 3 liv. p. 70 pl. III figs. 10, 11.

Cylindrical, with strong longitudinal lines and minute revolving wrinkled striæ; a slight elevation crowns the whorls, defined by a separating line; spire very short, apex rather obtuse; suture distinct; inferior portion of the columella with an elevated profoundly striated callus, above which are three or four lines revolving to the base; aperture gradually contracted above and effuse at the base.

Locality.—Claiborne, Alab. Middle Tertiary.

Of the species described by Lamarck, this shell approaches nearest to *A. canalifera*. These two species do not correspond entirely with the genus *Ancillaria*, as the aperture is much longer, the shells are striated, and the suture is somewhat channeled. They might constitute a separate genus by the name of OLIVULA, and would connect *Ancillaria* with *Oliva*.—[Conrad, 1832].

Nucleus consists of two and a half, smooth whorls; whorls of the spire crowded, those of the apex enveloped in the lower whorls; heavy, sutural callus collar extends over the upper margin of the lower whorl and lower margin of the preceding whorl with the suture a groove along the midline of the collar; the callus

[621]Vokes, H. E., Proc. Pal. Soc. in Proc. Geol. Soc. Amer. for 1935, p. 414, 1936.

[622]Personal communication from C. W. Stiles, July 9, 1937.

[623]Conrad, T. A., 1832, p. 25.

[624]Cossmann, M., Essais Pal. Comp., 3 liv., p. 70, 1899.

has deep sagittate, longitudinal lines; in most cases the sutural collar covers most of the surface of the whorls of the spire; shell covered with coarse, longitudinal lines crossed by coarse, spiral lines which give the surface a fine, cancellated appearance.

In shape, anterior notch and plications of the callus of the inner lip *A. staminea* is typical of the genus *Ancilla.* The heavy sutural collar distinguishes it from *Ancilla.* Conrad pointed out the differences and suggested the name *Olivula* to cover the group. He, however, included *A. canalifera* Lam. of the French Eocene and did not designate one of the two as type of the genus. Tryon and Fischer accepted the genus and listed *A. staminea* in each case but did not designate it as type. The type designation was not made until 1899, by Cossmann. In the meantime Bellardi used *A. canalifera* as the type of a new group *Ancillarina.* *A. canalifera* does not spread the callus in a consistent collar along the suture with the heavy, sagittate lines, as in *A. staminea.* Specifically *A. canalifera* has a smooth surface. There is great enough difference in the sutural callus of the two species for sectional rank so that Bellardi's name does not interfere with *Olivula* of Conrad. Further discussion of *Ancillarina* is given under *A. texana* Conrad.

The Conrad type collection consists of 14 specimens, labelled in Conrad's writing "Olivula staminea". None of the specimens, even one which is at present marked "X type", corresponds to Conrad's figure. This is a case in which Conrad's illustration seems to be a composite or idealized. The largest specimen is here chosen as the lectotype.

Dimensions.—Height, 49 mm.; greatest diameter, 16 mm., lectotype.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: locality 104.

Ancilla staminea punctulifera (Gabb) Plate 68, figs. 10, 17

Agaronia punctulifera Gabb, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 381, pl. 67, fig. 22.

Olivula punctulifera Conrad, 1865, p. 22; Conrad, 1866, p. 17; Heilprin, 1891, p. 398.

Fusiform, robust, whorls four, spire short; mouth nearly straight, wide; anterior sinus wide and moderately deep, posterior sinus narrow and deep; outer lip plain, nearly straight, inner lip with five or six very oblique folds. Surface marked by numerous longitudinal and revolving lines, so arranged as to leave between them a series of minute punctations; suture very distinct; a short distance below the suture there is a prominent revolving rib or carina of twice the size of the other ribs.

Dimensions.—Length .35 in., length of mouth .23 in., width of body whorl .14 in.

Locality.—Wheelock, Texas. Collection of Smithsonian Institution. Very rare. I have seen one specimen from Claiborne Ala., in the cabinet of Mr. Lea.—[Gabb, 1860].

In the lower Claiborne, *A. staminea* has the sculpture nearly typical but the spire is consistently and characteristically elevated more than in the type form of the Gosport sand. The sutural callus does not cover so much of the surface of the whorls of the spire. Gabb named his specimen from the punctate appearance of the surface. Worn specimens cause the fine, cancellate sculpture to appear punctate. This is not particularly limited to the lower Claiborne forms. The shells which fall under *A. punctulifera* have heretofore been given specific rank. The differences are not great enough to separate them more than varietally from the stock of *staminea.*

Dimensions.—Height, 27 mm.; greatest diameter, 8 mm.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707, 708, 723, 725, 727, 728, 730, 733, 734, 741, 756, 765, 766 and 803.

Ancilla staminea maternæ, new variety Plate 68, figs. 3, 8

Ancillaria staminea Aldrich, 1886, Geol. Sur. Ala. Bull. 1, pt. 1, p. 51.
Ancilla (*Olivula*) *staminea* Harris, 1897, Bull. Amer. Pal., vol. III, No. 11, p. 30, pl. 3, fig. 13.

Shell medium in size; spire elevated; columellar, parietal and sutural calli heavy; surface with coarse lines of growth and a few, microscopic, spiral lines.

The surface of *A. maternæ* does not show the fine, longitudinal and transverse sculpture of *A. staminea.* The surface is smooth with a microscopic intimation of the development of the sculpture which later is conspicuous on the species in the Claibornian. The sutural collar is well developed and is similar to that of *A. staminea* but the spire is more elevated in *A. maternæ.*

This form in the Sabine Eocene is clearly the ancestor of *A. staminea* of the Claibornian. Priority of naming confuses the stratigraphic and biologic significance.

Dimensions.—Height, 26 mm.; greatest diameter, 9 mm., holotype.

Holotype.—No. 3282, Paleontological Research Institution.

Occurrence.—Sabine Eocene: Woods Bluff, Ala.

Genus AGARONIA Gray, 1839[625]

Genotype by monotypy *Voluta hiatula* Gmelin (*Oliva hiatula* Lam.) Living. Western Africa.

Agaronia alabamensis (Conrad) Plate 68, figs. 14-16, 18-22; Plate 89, fig. 5

Oliva alabamensis Conrad, 1833, Sept., p. 32; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 41, pl. 16, fig. 3; H. C. Lea, 1848, p. 103; d'Orbigny, 1850, p. 351; Harris, 1895, p. 3.

Oliva Greenoughi Lea, 1833, Dec., p. 183, pl. 6, fig. 197; H. C. Lea, 1848, p. 103.

Oliva dubia Lea, 1833, p. 183, pl. 6, fig. 198; H. C. Lea, 1848, p. 103; non *Ancillaria dubia* Deshayes, 1824.

Oliva Phillipsii Lea, 1833, p. 184, pl. 6, fig. 199 immature; Conrad, 1834, App. in Morton, p. 5; H. C. Lea, 1848, p. 103; d'Orbigny, 1850, p. 351.

Oliva gracilis Lea, 1833, Dec., p. 182, pl. 6, fig. 196 [partim]; H. C. Lea, 1848, p. 103; de Gregorio, 1890, p. 52, pl. 3, fig. 51 not 50; Heilprin, 1891, p. 397; Harris, 1895, p. 21; non Broderip and Sowerby, 1829.

Lamprodoma alabamensis Conrad, 1865, p. 22; Conrad, 1866, p. 17.

Lamprodoma gracilis (Lea) Conrad, 1865, p. 22; Conrad, 1866, p. 17.

Oliva nitidula de Gregorio, 1890, p. 51, pl. 3, figs. 36-46 including var. *alabamensis* and var. *disposita* nec *O. nitidula* Dillwyn, 1817 nec *O. nitidula* Deshayes, 1824. Deshayes species renamed *O. parnensis* Cossmann, 1899, Revue Crit., p. 178.

Oliva mitreola de Gregorio, 1890, p. 51, pl. 3, figs. 47, 48 non Lamarck, 1813.

Oliva antelucana de Gregorio, 1890, p. 54, pl. 3, figs. 58-61 young.

Ancilla pinaculica de Gregorio, 1890, p. 54, pl. 3, figs. 63-65 young.

Olivella alabamiensis (Conrad) Cosmann, 1893, p. 40.

Olivancillaria (*Agaronia*) *alabamiensis* (Conrad) Cossman, 1899, 3 liv., p. 51.

Shell subfusiform, spire conical, acute, the whorls contracted, and defined by an impressed line above the suture. Length 1½+ inches.

Locality.—Claiborne, Alab. Cab. Acad. N. S.—[Conrad, 1833].

Subfusiform; spire elevated, acute; whorls contracted or indented above the suture; aperture effuse.

Syn. O. greenoughi, O. dubia, O. gracilis, (*young*) *Lea, Con. p.* 183, *pl.* 6, *f.* 196, 197, 198.

Locality.—Claiborne, Alab.

A variable species, and remarkably abundant. A variety has the spire so elevated that the aperture is little more than half the length of the shell, which is unusually slender.

O. Phillipsii, Lea, may be a variety in the very young state.—[Conrad, 1835].

The nucleus consists of one and a half or two whorls, smooth, the last whorl enlarged, the sutures of the nucleus are indistinct

[625]Gray, J. E., 1839, p. 132.

not channelled as in the adult. The aperture is wide anteriorly. There is a well-developed anterior callus and fold which have oblique plications. The anterior callus extends to or a little beyond the midline of the aperture. It has a strong twist and bounded by a sharp edge. Above there is a wide callus, bounded by a sharp line, the growth lines in this area change direction along a midline to conform to the siphonal notch. The parietal callus continues around the posterior canal and extends along and above the suture the full length of the spire. The sutural callus extends in the form of a narrow collar giving the suture the channelled appearance. The callus collar is different in coloration from the rest of the shell and may be easily differentiated. On some specimens where the difference in the coloration of the callus and the shell proper has been obliterated the callus may be detected under the microscope by light reflection which shows the differences in the two matrices. A few specimens will show the sutural collar completely obliterated and the whorls have an entirely different appearance at the suture. Where the callus is completely eroded the suture does not have the grooved or channelled appearance but the margin of the whorl projects over the suture as when a sheet of paper is twisted to form a cone. One may easily be deceived and consider the specimens otherwise typical but lacking the sutural callus, as distinct species. There are hundreds of specimens as in *A. alabamensis,* specimens with the callus in different stages of erosion or absorption. *A. alabamensis, A. bombylis* and *A. mississippiensis* have similar and characteristic nuclei and similar columellar, parietal, and sutural calli. The three species are typical of the genus *Agaronia.* In each of the three species specimens are found, typical of each otherwise but show the obliterated, sutural callus.

The body whorl of *alabamensis* is plump. The spire becomes elevated with age so that the adult would be considered an elongate species. Immature shells appear more convex and such specimens confused Lea and De Gregorio. The young shells may be distinguished from *A. bombylis* with which it is associated and which are alike otherwise, by the more convex body whorl and by one less whorl. *A. bombylis* has the sides of the body whorl nearly parallel making a much more slender form. *A. alabamensis* has four whorls in the immature stages while *A. bombylis* has five in the same stage. Young stages of *alabamensis* have a well-developed anterior callus with the plications developed, as well as the sutural callus. De Gregorio seemed in his study of the gastropods where he had specimens of all stages of growth of a species, to lose the perspective of the life history of the species. He, throughout the Alabama monograph, gave many names to young stages of a species with different names to the adults of the same species. *Oliva antelucana* and *Ancilla pinaculica* de Gregorio are young specimens of those same species which show the typical calli and plications.

Cossmann was the first to place *A. alabamensis* in the proper genus. He, however, did not see that *Oliva bombylis*, Claiborne Eocene and *Oliva mississippiensis* Conrad, Vicksburg Oligocene, had similar generic characters and that they were typical Agaronias. He placed the three species in different genera. One of the unique and striking characters in the study of the three forms is the nucleus which is different from that of *Olivella* or *Oliva*. The nucleus may be more enlarged in the fossil species than the living type. The sutural callus extends in a narrow band in *Oliva* but *A. alabamensis* lacks the parietal plication of *Oliva*. The sutural callus in *Olivella* is not restricted or as conspicuous in *Agaronia* and spreads more completely over the whole whorl.

De Gregorio placed *A. alabamensis* as a variety of *O. nitidula* Deshayes of the Paris Basin. Cossmann noted the distinction between the two species. *A. alabamensis* has an entirely different shape than *O. nitidula* Deshayes (renamed *parnensis* by Cossmann). On *A. alabamensis* the spire is higher, the greatest width is about the mid-region of the body whorl and the sides of the shell taper with about the same convexity to the anterior and posterior extremities from the midline. On *O. parnensis* the greatest width of the body whorl extends over a greater length of the whorl making the sides of the shell nearly parallel over the middle half of the shell. The American species attains a size much larger than the Parisian.

The Conrad type collection of *O. alabamensis* consists of 9 specimens of varying shapes.

The four type specimens of *O. gracilis* Lea No. 5914, are young *O. alabamensis.* Another specimen No. 5915, is probably the young of *O. bombylis.*

A. alabamensis is abundant in the Gosport sand.

Dimensions.—Height, 42 mm.; greatest diameter, 16 mm., lectotype. Height, 10 mm.; greatest diameter, 3.5 mm., lectotype *O. gracilis* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; *O. greenoughi* Lea, No. 5916, A. N. S.; *O. dubia* Lea, No. 5920, A. N. S.; *O. Phillipsi* Lea, No. 5926, A. N. S.; *O. gracilis* Lea, No. 5914, A. N. S.

Occurrence.—Lower Claiborne: localities 103, 136, 708, 725, 726, 727, 728, 729, 731, 733, 734, 741, 743 and 803. Gosport sand: locality 104 (type).

Agaronia bombylis (Conrad) Plate 68, figs. 12, 13

Oliva bombylis Conrad, 1833, Sept., p. 32; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 42; pl. 16, fig. 4; H. C. Lea, 1848, p. 103; d'Orbigny, 1850, p. 351; Heilprin, 1891, p. 397; Harris, 1895 p. 8.
Oiiva constricta Lea, 1833, Dec., p. 182; pl. 6, fig. 195; H. C. Lea, 1848, p. 103.
Oliva gracilis Lea, 1833, p. 182, [partim]; non *O. gracilis* Broderip and Sowerby, 1829.
Lamprodoma bombylis Conrad, 1865, p. 22; Conrad, 1866, p. 17.
Oliva bombylis (Conrad) de Gregorio, 1890, p. 52, pl. 3, figs. 49, 52.
Olivella bombylis (Conrad) Cossmann, 1893, p. 40; Cossmann, 1899, 3 liv., p. 54.

Shell slender, subcylindrical, acute; aperture narrow; sutural canal well defined; columella with about seven striæ. Length ¾ of an inch.
Locality.—Claiborne, Alab.
Cab. Acad. N. S.—[Conrad, 1833].
Shell slender, subcylindrical; spire prominent, acute, the volutions with an obsolete impressed line.
Syn. O. constricta, *Lea, Con. p.* 182, *pl.* 6, *p.* 195.
Locality.—Claiborne, Alab.
Allied to *O. clavula,* Lam. rare.—[Conrad, 1835].

Nucleus consists of one and a half or two whorls. The last whorl of the nucleus enlarged, suture not grooved, indistinct, the whole appears globular and gives the shell an appearance of a projected but blent end. *A. alabamensis* and *A. mississippiensis* Conrad have similar nuclei. In the young stages *A. bombylis* may be confused with *A. alabamensis* but with careful observation may be distinguished at all stages of growth by the difference in shape. *A. bombylis* is more slender. Comparing young specimens up to 10 mm., in height of both species *A. alabamensis* is nearly a millimeter wider in its greatest diameter than *bombylis*. After about such a growth *A. alabamensis* increases rapidly the diameter of the body whorl, giving the body whorl greater convexity than the whorls of the spire. *A. bombylis* remains slender. *A. alabamensis* also elevates the spire. *A. bombylis* does not attain the size nor abundance of *alabamensis*.

Dimensions.—Height, 23 mm. ;greatest diameter, 7 mm., lectotype. Height, 23 mm.; greatest diameter, 7 mm., lectotype *O. constricta* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. *O. constricta* Lea, No. 5911, A. N. S.

Occurrence.—Lower Claiborne: localities 707, 733 and 734. Gosport sand: locality 104 (type).

"Tortoliva" texana Conrad Plate 68, fig. 2

Tortoliva Texana Conrad, 1865, pp. 22, 143, pl. 21, fig. 4. *Tortoliva* new genus with monotype *T. texana* Conrad, p. 143; Heilprin, 1891, p. 398.

Subcylindrical, or subovate; spire short, obtuse; aperture elongated, effuse at base; columella callous, with an impressed, oblique fold.—[Generic].

Anciliform, smooth; spire papilliform, and consisting of two volutions; an impressed, sinous line extends along the body near the columella, beneath which an oblique impressed is continued from the columellar fold. Length ½ inch.—[Conrad, 1865, specific].

Conrad described and figured a small *Ancilla* which he made the monotype of a new genus. The figure is obscure and suggests a young shell. The type was lost and the species has not been rediscovered. Presumably the shell came from Texas. The figure shows a shell of the type of *A. canalifera* Lam. which Bellardi made the type of a new group, *Ancillarina*, in 1882. Conrad's name has priority of date if his shell is like *A. canalifera*. With the little data and no material available to study the genus *Tortoliva*, one doubts the scientific value of carrying the name in literature. Certainly one can not, as Cossmann has done in the Essais Pal. Comparée, 3 liv., p. 67, give a thorough description of the genus when the type is so obscure. It is rather poor logic to use the characters of *A. canalifera* when one cannot be sure that the two are the same. The name is inserted here only for completeness. Until further information concerning *T. texana* is available, *Ancillarina* Bellardi[626] is regarded as the proper term to cover such type of shell as *A. canalifera* Lam.

Oliva platonica de Gregorio Plate 68, figs. 1, 4-6

Oliva platonica de Gregorio, 1890, p. 53, pl. 3, figs. 53-56; Cossmann, 1893, p. 40.

Testa elegans, solida; spira brevi, conica; primis duobus anfractibus mammillatis; caeteris 4 *planis, laevigatis, angustis, sutura profunda divisis; ultimo anfractu magno, subcylindrico, verum autem turgidulo, antice zona callosa cincto (in qua duae lineae prominulae decurrunt, nempe antica usquead angulum anticum labri externi, postica zonam limitat); labro columellari plicato; plicis circiter* 10, *ex quibus duabus majoribus; apertura majore quam dupla spira.*

C'est une espèce très caractéristique, qui tient beaucoup de l'*O. Phillipsi* Lea, dont elle diffère par la forme, par la spire moins développée, par le nombre des plis de la lèvre columellaire, et par la callosité antérieure du l' avant dernier tour. Lea dit que le défaut de cet épaississement est le caractère plus intéressant de son espèce, tandis que il se trouve bien dans la nôtre.—Ces deux espèces, avec l' *O. antelucana* De Greg., forment un groupe particulier dont mes deux espèces seraient aux extrémités opposées et celle de Lea au milieu d'elles.

Notre espèce a aussi beaucoup de ressemblance avec l' *Oliva* (*Dactylus*) *eboreus* Conr. (1867 Conrad Descr. new gen. species with notes on oth. foss. and recent spec. p. 261, pl. 11, f. 11) du miocène de Virginia; elle en diffère par la taille plus petite et par le sillon médiane du dernier tour. Notre espèce pourrait avoir de l'analogie avec l' *Oliva minima* Lea; mais celle-ci est une espèce aussi douteuse, que je ne suis pas sur, même de son genre. Elle est, en outre, extrêmement voisine de l' *O. Dufresnei* Bast. (in Beyrich Test. Conch. pl. 2, f. 7-8).—(Coll. mon Cabinet).—[De Gregorio, 1890].

Nothing similar to this has been found in the collection. It is similar to *Oliva* Martyn[627], but that genus is not Eocenic. The specimens may be extraneous.

Holotype.—De Gregorio home, Via Mola 132, Palermo, Sicily.

Occurrence.—Gosport sand: Claiborne, Ala. (De Gregorio).

Nomina Nuda

Olivia carolinensis Conrad, 1842, Nat. Inst., Proc., 2d Bull., p. 174, footnote, from Eocene of South Carolina. It is not *Dactylus carolinensis* Conrad (=*Oliva*), 1862, Acad. Nat. Sci. Phila., Proc. vol. XIV, p. 584 from the Miocene.

Olivella bombylis burlesonia Kennedy, 1895, Acad. Nat. Sci. Phila., vol. 47, p. 116. It was a MS. name of Harris.

[626]Bellardi, L., 1882, pt. III, p. 217.

[627]Martyn, Thos., 1786, vol. 3, expl. table, pl. III; Dall, W. H., Proc. U. S. Nat. Mus., vol. 29, p. 428, 1905, subsequent designation of type. *O. corticata* Martyn. Living. ''Coasts of Guinea''; Woodring, W. P., 1928, p. 225.

Family CANCELLARIIDÆ

Genus TRIGONOSTOMA Blainville, 1825[627a]

Genotype by monotypy *Delphinula trigonostoma* Lamarck. Living. Indo-Pacific.

Trigonostoma babylonicum (Lea) Plate 73, figs. 22, 24-26; Plate 89, fig. 15

Cancellaria babylonica Lea, 1833, p. 138, pl. 5, fig. 134; H. C. Lea, 1848, p. 97; Conrad, 1865, p. 31; Conrad, 1866, p. 12; Harris, 1895, p. 6.
Cancellaria (*Trigonostoma*) *Babylonica* (Lea) de Gregorio, 1890, p. 46, pl. 3, fig. 11.
Cancellaria (*Trigonostoma*) *tera* de Gregorio, 1890, p. 46, pl. 3, fig. 12-13.
Trigonostoma babylonicum (Lea) Cossmann, 1893, p. 41; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 25.

Shell turrited, inflated, smooth, substance of the shell thin; whorls six, angular, broad and flat at the top, and furnished on the angle with irregular erect spinous tubes; umbilicus wide, armed with points; mouth triangular, two fifths of the length of the shell; columella with two indistinct folds; outer lip sharp.

Length .5, Breadth .3, of an inch.

Observations.—A single specimen only of this beautiful species has come into my possession. It is very distinct from any species I know, and is eminently distinguished by the flatness of the superior part of its whorls and the spinous tubes placed along the angle. The wide umbilicus and armature of points are very characteristic.—[Lea, 1833].

This species is distinct from *T. gemmatum* Conrad with which it has been united by authors. It differs from that species in lacking the longitudinal ribs or having them obscurely developed. The sculpture of this species consists of ten to twelve flutes or spines which extend from the shoulder of the whorl. The number of longitudinal ribs in *T. gemmatum* varies from 14 to 17. *T. babylonicum* has an umbilicus which is twice or three times that of *T. gemmatum.* De Gregorio separated specimens which were more elevated, larger mouthed and more spinous, under a new name *tera.* One doubts that such a separation is consistent.

The nucleus consists of two and a half or three whorls, globose, flat above with the first whorl minute.

A worn specimen from the Orangeburg locality shows an understructure of flat, revolving ribs over all the whorls except the nucleus.

Dimensions.—Height, 13 mm.; greatest diameter, 8 mm., lectotype.

[627a]Blainville, H. M. D. 1825 p. 652.

Lectotype.—No. 5719, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707, 708, 723, 728 and 741. Gosport sand: locality 104 (type).

Trigonostoma gemmatum (Conrad)

Plate 69, figs. 15, 16, 19, 20, 24; Plate 90, figs. 8, 12, 22

Cancellaria gemmata Conrad, 1833, p. 35; Conrad, 1834, App. in Morton, p. 5 [partim]; Conrad, 1835, p. 44, pl. 16, fig. 10; H. C. Lea, 1848, p. 97; d'Orbigny, 1850, p. 355 [partim]; Crosse, 1861, Jour. de Conch., vol.IX, 3d ser., T. 1, p. 247 group Trigonostomes; Conrad, 1866, p. 13; Harris, 1895, p. 20.

Cancellaria (*Babylonella*) *gemmata* Conrad, 1865, p. 32.

Cancellaria multiplicata Lea, 1833, p. 139, pl. 5, fig. 135; H. C. Lea, 1848, p. 97; Conrad, 1866, p. 13; de Gregorio, 1890, p. 49, pl. 3, fig. 31.

Cancellaria (*Babylonella*) *multiplicata* (Lea) Conrad, 1865, p. 32.

Cancellaria plicata Lea, 1833, p. 139, pl. 5, fig. 136; H. C. Lea, 1848, p. 97; Conrad, 1866, p. 13; de Gregorio, 1890, p. 50, pl. 3, fig. 32.

Cancellaria (*Babylonella*) *plicata* (Lea) Conrad, 1865, p. 32.

Cancellaria costata Lea, 1833, p. 141, pl. 5, fig. 140; H. C. Lea, 1848, p. 97; Crosse, 1861, Jour. de Conch., vol. IX, 3d ser. T. 1, p. 256; Conrad, 1865, p. 31; de Gregorio, 1890, p. 47, pl. 3, fig. 30.

Babylonella costata (Lea) Cossmann, 1893, p. 41.

Cancellaria (*Babylonella*) *impressa* Conrad, 1865, p. 145, pl. 11, fig. 16.

Cancellaria impressa Conrad, 1866, p. 13.

Cancellaria (*Trigonostoma*) *impressa* (Conrad) de Gregorio, 1890, p. 47, pl. 3, fig. 16.

Trigonostoma impressum (Conrad) Cossmann, 1893, p. 41 includes *propegemmatum* de Gregorio; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 25, pl. 1, fig. 25.

? *Cancellaria lirata* Conrad, 1865, pp. 32, 145, pl. 11, fig. 3; Conrad, 1866, p. 13; Heilprin, 1891, p. 397.

Cancellaria (*Trigonostoma*) *propegemmata* de Gregorio, 1893, p. 46, pl. 3, figs. 14-15.

Trigonostoma propegemmata (de Gregorio) Cossmann, 1899, Essais Pal. Comp. 3 liv., p. 25.

Cancellaria (*Babylonella*) *gemmata* Conrad, 1865, p. 32.

Cancellaria (*Trigonostoma*) *gemmata* (Conrad) de Gregorio, 1890, p. 47, pl. 3, fig. 18; Dall, 1890, p. 44.

Trigonostoma gemmatum Cossmann, 1893, p. 41; Cossmann, 1899, l. c., p. 25.

Shell conical, acute, scalariform, with longitudinal costæ; transverse lines not very distinct; shoulder acute; columella three toothed; internally with about nine raised lines; umbilicus open; aperture triangular. Length ⅝ of an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Scalariform; with longitudinal acute ribs which coronate the whorls; spire much elevated; spiral lines obsolete; columella concave, 3-plaited; umbilicus effuse, carinated on the margin; labrum obtusely reflected. striate within; aperture subobovate.

Syn. C. babylonica, *Lea. Con. p.* 138, *pl.* 5, *f.* 134.

Locality.—Claiborne, Alab.

A beautiful species, remarkable in not being cancellated; it is not abundant but generally very perfect. No. 3, first ed. p. 35.—[Conrad, 1835].

The nucleus consists of three smooth whorls, the first minute and flat. The third globose and four or five times the size of the first two. The longitudinal ribs are greatly elevated and give a sharp, fluted appearance to the margin of the shoulder of the whorl. The longitudinal ribs may occur over the whole length of the body whorl or they may extend only over the upper portion of the body whorl. Typically revolving ribs are obsolete but obscure spiral ribs may occur. They usually occur on the upper whorls of the spire but may be found at times on any whorl.

The number of longitudinal ribs vary from 14 to 17 with 14 as the average number. They extend the full length of the first three whorls of the spire. Young specimens equivalent in development to the apical whorls of the mature specimens have the longitudinal ribs occurring the full length of the whorl. Obviously De Gregorio's *propegemmatum* consists of immature shells of *gemmatum.* The largest specimen in the collection has 2 plications on the columella. Medium sized shell may have three plications and young forms may have 2. One doubts that the character of three columellar plications as given by many authors holds consistently throughout the genus. Other Eocene species have only two plications. On some specimens the crenulations on the inner surface of the labrum are strong and on some that surface is smooth.

The revolving lines or ribs vary in all stages of the development of this species. The shell which Conrad figured was a large one without the spiral lines. The individuals of the species have been separated into two groups, those without spiral lines on any portion of the shell and those with lines fully and obscurely developed at some place on the shell. The number of longitudinal ribs and all the other characters of the shells are identical showing that the transverse lines on *gemmatum* are not a constant character. Enlarged drawings of the types of Lea's specimens of his species of *costata, multiplicata* and *plicata* show that they are individuals of *T. gemmatum* (Conrad) representing different stages of growth with varying amount of transverse striations.

The other characters which are constant, such as the character of the longitudinal ribs and the sharp, flat shoulder of the whorls are alike in all the forms.

C. impressa Conrad is a gerontic specimen of *gemmata.* The largest specimen of *gemmata* in the Harris collection does not duplicate Conrad's figure of *impressa.*

The validity of *Cancellaria lirata* Conrad, is in doubt. Conrad described the species from Texas. Harris in his Texas MS. stated that the probable types at the Academy of Natural Sciences were labelled *"Cancellaria lirata"* Conrad Ala?" in Conrad's handwriting. The specimens were not found in 1936. Harris verified Heilprin's determination that the shells were *C. plicata* Lea. The species probably came from Alabama and is the same as *T. gemmatum* (Conrad). Conrad's figure is copied and included herein, pl. 69, fig. 24.

Dimensions.—Height, 25 mm.; greatest diameter, 14 mm., lectotype *C. gemmata* Conrad. Height, 20 mm.; greatest diameter, 11 mm., lectotype *C. impressa* Conrad. Height, 5.5 mm.; greatest diameter, 3 mm., lectotype *C. costata* Lea. Height, 7 mm., greatest diameter, 4 mm., lectotype *C. plicata* Lea.

Lectotype.—Academy Natural Sciences, Philadelphia, Pa.; *C. impressa* Con. A. N. S.; No. 5730, A. N. S., *C. costata* Lea; No. 5721, A. N. S. *C. plicata* Lea.

Occurrence.—Lower Claiborne: locality 734 (*costata*). Gosport sand: locality 104 (type).

Trigonostoma pulcherrimum (H. C. Lea) Plate 70, figs. 2, 9; Plate 90, fig. 7

Cancellaria pulcherrima H. C. Lea, 1841, Amer. Jour. Sci., vol. XL, p. 99, pl. 1, fig. 15; H. C. Lea, 1848, p. 97; de Gregorio, 1890, p. 47, pl. 3, fig. 19.

Cancellaria (*Aneurystoma*) *dictyella* Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 24 nomen nudem.

C. testa sub-fusiformi, cancellata, striis longitudinalibus aequalibus transversis, lineis crebrissimis parvis, transversis, sub-crassâ, umbilicatâ; spirâ obrusâ, mammillatâ; anfractibus senis, convexis, supernè angulatis; suturis impressis; umbilico parvo; columellâ duabis plicis; aperturâ sub-ellipticâ; canale brevissimo; labro crassissimo.

Shell sub-fusiform, cancellate, with the longitudinal striæ equal to the transverse ones, with small transverse lines very near each other, somewhat thick, umbilicate; spire obtuse, mammilate; whorls six, convex, angular above; sutures impressed; umbilicus small; columella with two folds; mouth sub-elliptical; canal very short; outer lip very thick.

Length .4. Breadth — of an inch.

Remarks.—This elegant little species is remarkable for the raised points at the intersections of the longitudinal and transverse striæ, which render it muricated, and give it a beautiful appearance. It resembles considerably *C. multiplicata*, Lea, but may easily be distinguished from that species, by its being cancellate and muricate, but I cannot determine whether the shape of the mouth differs, as the outer lip of my only specimen is very much fractured. The mouth is just half as long as the shell. —[H. C. Lea, 1841].

Lea described this interesting little species well. His figure was poor hence the species has been overlooked so far as its identity is concerned. The Meyer drawing of the holotype is included. This shows the character of the shell clearly. Specimens have not been obtained from the type area, the Gosport sand at Claiborne but several shells have been found from the lower Claiborne horizon near Orangeburg, S. C. which prove to be a variety.

In answer to an inquiry to André Chavan, Nanterre (Seine), France concerning the undescribed *Cancellaria dictyella* of Cossmann, the included drawing of the types of *dictyella* and notes of the specimens were generously sent by M. Chavan. The illustration shows Cossmann's shells to be the obscure *C. pulcherrima* H. C. Lea.

The author had placed *pulcherrima* in *Trigonostoma* with certain reservations. It was gratifying to find that M. Chavan placed the *dictyella* of Cossmann in *Trigonostoma*. Cossmann's two specimens came from the Gosport sand at Claiborne.

This species seems to have its characters modified when compared with the exaggerated features of typical *Trigonostoma*. The type of *Trigonostoma* has two large plications with a third at the fold of the canal. One finds in Eocene species otherwise typical, a variation in the number of plications. Within the same species sometimes the number will vary from two to three. In some cases, therefore, the difference in number of plications is not a hard and fast character.

Dimensions.—Height, 10.5 mm.; greatest diameter 5 mm., holotype.

Holotype.—No. 13179, Academy of Natural Sciences, Philadelphia, Pa.; types *C. dictyella* Cossmann, No. 11908, Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Occurrence.—Gosport sand: Claiborne, Ala.

Trigonostoma pulcherrimum chavani, new variety Plate 70, figs. 4, 10

The nucleus consists of four smooth, globose whorls, the first minute; the third and fourth whorls greatly enlarged; sculpture of the adult begins abruptly on the first post-nuclear whorl; sculpture consists of three spiral ribs on the whorls of the spire crossed by about fourteen longitudinal ribs; intersections of the two series sharply nodose; about ten transverse ribs on the body whorl; microscopic spiral lines occur between the large spiral ribs; shell elongate; umbilicus small; three plications on the columella.

This form differs from typical *pulcherrimum* in being narrower and having the spire more elevated. It has a smaller umbilicus and a smaller third plication. The sculpture of *chavani* is typical. *Chavani* has the plications nearer like typical *Trigonostoma* but the umbilicus is reduced. The size of the umbilicus varies with the age of the individual in both *pulcherrimum* and *chavani*.

Named in honor of André Chavan, Nanterre (Seine), France.

Dimensions.—Height, 12 mm.; greatest diameter, 5 mm.

Syntypes.—Nos. 3309 and 3310, Paleontological Research Institution.

Occurrence.—Lower Claiborne, McBean formation; locality 707.

Trigonostoma panones (Harris) Plate 69, figs. 6, 10, 11

Cancellaria panones Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 65, pl. 6, fig. 1.

Size and general form as shown in the figure; whorls 5; 1 and 2 smooth; 3 and 4 with sharp Scala-like costæ, shoulder narrow, slightly convex; body whorl shouldered as 3 and 4, with about fifteen smooth sharp costæ, spirally striate below; mouth ovate triangular, with about ten labrum crenulæ and three columellar folds; umbilicus not very large.

In this species the ribs are often somewhat irregular. On the spiral whorls two or three ribs are considerably larger than the others. The costæ just behind the aperture are generally of small size or evanescent.

Localities.—Smithville, Bastrop Co.; 2 miles east of Alto, Cherokee Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

This species is like *T. gemmatum* in having longitudinal ribs the predominating sculptural character. The two forms belong to the same stock and seem to be susceptible to the same variation in regard to the spiral ribs. The lower Claibornian species has the development of characters accelerated and they present greater strength. The number of longitudinal ribs is the same in *panones* as in *gemmatum*. One is tempted to place the forms together. *T. gemmatum* is more elongate. There is a striking tendency in *T. panones* to develop varices. The Harris collection contains a specimen from Smithville, Texas which has two well-developed varices. Other specimens show only irregular ribs and a slight enlargement of the varix rib. The character however is interesting in the generic relationship and shows that perhaps the presence of varices may not be altogether a constant one for generic limitations.

Dimensions.—Height, 10 mm.; greatest diameter, 6 mm.

Holotype.—Department of Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 733.

Trigonostoma panones smithvillensis (Harris) Plate 69, figs. 12, 21, 22

Cancellaria panones var. *smithvillensis* Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 65, pl. 6, fig. 2.

Differs from the typical form in having spiral striæ; about four on the lower spiral whorls and fourteen on the body whorl. The mouth is slightly lrger in proportion to the length of the shell.

Localities.—Smithville, Bastrop Co., Little Brazos River, near iron bridge on Mosley's Ferry road; Orrell's crossing Elm Creek, Lee Co., Tex.

Geological horigon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Holotype.—Department of Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Texas; locality 707.

Trigonostoma panones junipera (Harris) Plate 69, figs. 13, 14, 18, 23

Cancellaria panones junipera Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 65, pl. 6, fig. 3.

In this variety the spiral striæ are quite numerous, the mouth is small in comparison with the length of the shell, and there are but two prominent columellar folds.

Localities.—Smithville, Bastrop Co.; Bluff on Colorado River just below the mouth of Alum Creek, not far above Smithville; Cedar Creek, southeast corner of Wheelock League, Robertson Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Holotype.—Department of Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Texas. (Harris); localities 138 and 741.

Trigonostoma penrosei (Harris) Plate 69, fig. 17

Cancellaria penrosei Harris, 1895, Acad. Nat. Sci. Phila., vol. 47, p. 66, pl. 6, fig. 4.

Admete (*Bonellitia*) *Pemrosei* (Harris) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 34 [error for *penrosei*].

Size and general form as indicated by the figure; whorls 5; 1, 2, 2½ smooth; 3, 4 cancellated by about 18 sharp ribs over which pass 5 spiral lines, the uppermost on the humeral angle and some little distance above the others; body whorl with about eighteen costæ and twelve revolving lines, the uppermost of which, on the humeral angle is separated from the next below by a double space; aperture with two columellar folds and about six lateral crenulæ; umbilicus moderate. Surface not polished as in the two above-described species.

Localities.—Smithville, Bastrop Co.; Dr. Williams' quarry, R. Stephenson's Headright, Brazos Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

T. penrosei seems to be of the *gemmatum panones* stock which has developed the revolving ribs to a strength about equal to the longitudinal ribs and gives the surface of the shell a cancellated ornamentation.

Holotype.—Department of Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 723 and 733.

Trigonostoma harrisi, new species Plate 70, figs. 3, 6

Nucleus consists of three smooth whorls, first minute, flat above, third whorl enlarged and globose; well-developed longitudinal ribs and obscure, spiral ribs begin with the post-nuclear whorls which consist of four whorls; the whorls are sculptured with ten or eleven sharp, longitudinal ribs crossed by three spiral ribs; at the intersection of the radial and spiral ribs the longitudinal ribs become nodose; the whorls are angulated and shouldered at the first spiral rib; the mouth is triangular with three plications on the columella and six crenulations on the labrum.

This species is found and associated with *T. panones* and its varieties from which it differs in having a smaller number of longitudinal costæ and spiral striæ. The nodose character of the longitudinal costæ is unique.

Named in honor of Prof. G. D. Harris, who collected the specimen.

Holotype.—No. 3308, Paleontological Research Institution.

Dimensions.—Height, 9 mm.; greatest diameter, 5 mm.
Occurrence.—Lower Claiborne: locality 733.

Trigonostoma auroræ, new species Plate 73, figs. 14-16

Shell small; nucleus consists of about two and one-half smooth whorls, first minute, last enlarged; post-nuclear whorls sharply shouldered and sculptured with fine, close-set, spiral lines crossed by the lines of growth which gave a microscopic cancellation; cancellation more conspicuous on worn specimens; the area between the shoulder and the suture is smooth; post-nuclear whorls three, body whorl enlarged; the margin of the shoulder has incipient fluting; umbilicus present; three plications on the columella.

The species is unique in the Claibornian. It is like *T. babylonicum* (Lea) in the elongate body whorl, short spire and in the character of the slightly fluted margin of the shoulder. It differs from *babylonicum* as well as the other shouldered species of Claibornian Trigonostomas in having the fine, yet conspicuous, spiral lines.

The holotype comes from the lower Claiborne at Orangeburg, S. C. A specimen from the Gosport sand collected by Mr. Aldrich is the same species. It differs in being broader with a larger umbilicus. The size of the umbilicus varies with age so that character would not be specific. The differences in shape might warrant making the Claiborne specimen a variety.

Dimensions.—Height, 6.5 mm.; greatest diameter, 4 mm., holotype.

Holotype.—No. 3351, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 707 (type). Gosport sand: locality 104.

Genus **SVELTIA** Jousseaume, 1887.[628]

Genotype by original designation, *S. varicosa* (Brocchi).[629] Pliocene. Southern Europe.

Sveltia alveata (Conrad) Plate 70, figs. 18-20; Plate 89; figs. 2, 17

Cancellaria alveata Conrad, 1833, p. 45; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 44, pl. 16, fig. 19; H. C. Lea, 1848, p. 97;

[628]Jousseaume, F. Le Naturaliste, ser. 2, year 9, p. 214, 1887.
[629]Brocchi, G., 1814, p. 31 spelled *Voluta varricosa*.

d'Orbigny, 1850, p. 355; Crosse, 1861, Jour. de Conch., vol. IX, p. 255 group Mitroformes; Conrad, 1865, p. 31; Conrad, 1866, p. 12; de Gregorio, 1890, p. 48, pl. 3, figs. 23-26; Harris, 1895, p. 4.

Babylonella alveata (Conrad) Cossmann, 1893, p. 41.

Sveltia alveata (Conrad) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 21.

Cancellaria sculptura Lea, 1833, p. 140, pl. 5, fig. 137; H. C. Lea, 1848, p. 97; Crosse, 1861, Jour. de Conch., vol. IX, p. 255.

Cancellaria tessellata Lea, 1833, p. 140, pl. 5, fig. 138; H. C. Lea, 1848, p. 97; =*C. Leai* Crosse, 1861, Jour. de Conch., vol. IX, p. 255, non *C. tessellata* Sowerby, 1832.

Turrited, with oblique acute costæ, and revolving elevated lines; volutions six, the two terminal ones smooth; aperture semilunar; three folds on the columella, the lower one obsolete; labrum obscurely striated.—[Conrad, 1833].

Subfusiform; turrited; revolving lines fine but distinct; whorls obtusely angulated; columella 3-plaited, labrum striate within.

Syn. C. multiplicata, C. sculptura, C. tessellata, C. elevata, C. costata, C. parva, *Lea, Con. pl.* 5, *f.* 135, 136, 138, 139, 140, 141.

Locality.—Claiborne, Alab.

This small species is readily distinguished from the preceding: No. 4, first edition. p. 45.—[Conrad, 1835].

The illustration of *alveata* of Conrad and of *sculptura* and of *tessellata* of Lea are so small that the true character of the ornamentation is obscured. The Meyer drawings of the types of the two species of Lea are included herein. They are the same as *C. alveata* Conrad.

S. alveata is fairly common in the Harris collection. The angulation of the upper part fo the whorls is the unique part of the species. Below the angulation the revolving ribs are well defined with wide interspaces, above the shoulder the revolving lines are fine and may be seen only with the lens although on many specimens the first two or three spiral lines are coarser. Irregular, obscure varices may occur. There are usually two plications on the columella but sometimes a small lower third one is present. The umbilicus is small and varies in size. Some specimens have the area entirely covered. The nucleus consists of three smooth whorls, flattened on the tip. The sculpture of the post-nuclear whorls begins with longitudinal costæ.

The type specimens of *C. sculptura* Lea have a label, *C. "sculpturata"* in the box.

Dimensions.—Height, 9 mm.; greatest diameter, 6 mm., lectotype *C. sculptura* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5725, A. N. S. *C. sculptura* Lea; No. 5728, A. N. S. *C. tessel-*

lata Lea.

Occurrence.—Lower Claiborne: localities 707 and 708. Gosport sand: locality 104 (type).

Genus **SVELTELLA** Cossmann, 1889.[630]

Genotype by original designation *C. quantula* Deshayes. Eocene. Paris Basin.

Sveltella parva (Lea) Plate 70, figs. 11-13; Plate 89, fig. 6

Cancellaria parva Lea, 1833, p. 142, pl. 5, fig. 141; H. C. Lea, 1848, p. 97; Conrad, 1865, p. 33; Conrad, 1866, p. 13; de Gregorio, 1890, p. 50, pl. 3, fig. 34, 35 poor fig.; Harris, 1895, p. 33; Crosse, 1861, Jour. de Conch., vol. IX, p. 255; non *C. parva* Philippi, 1860.

? *Cancellaria percostata* de Gregorio, 1890, p. 48, pl. 3, figs. 21, 22.

Sveltella parva (Lea) Cossmann, 1893, p. 41; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 30.

Shell somewhat elevated, turrited, with large longitudinal folds cut by large elevated transverse striæ, spire elevated, obtuse at the apex; suture deeply impressed; whorls five, convex; umbilicus very small; mouth semilunate; columella furnished with two large folds; outer lip sharp, within crenulate.

Length .2, Breadth .1, of an inch.

Observations.—This truly beautiful little species is very distinct from either of the others here described. It may be at once known by its strong folds on the columella, and its large longitudinal folds and strong transverse striæ.—[Lea, 1833].

The small species may be easily distinguished by the wide, revolving ribs and its lack of an anterior canal. The character of the spiral ribs varies from flat ribs with narrow interspaces to elevated ribs with wide interspaces. The two plications on the columella are distinct. The size of the umbilical opening varies. It is rare and when present is small. The nucleus consists of three smooth whorls. The apical one is minute and flattened. The longitudinal costæ vary in strength.

The type of the genus *Sveltella* created by Cossmann is from the Paris Basin Lutetian. Six other species are recorded by Cossmann from the same basin. *S. parva* seems to be typical of the genus. Wrigley[631] described numerous species from the Eocene of England.

Dimensions.—Height, 6 mm.; greatest diameter, 3 mm., lectotype.

[630] Cossmann, M., Ann. Soc. Roy. Mal. de Belgique, t. 24, IV ser. t. 4, p. 22?, 1889.

[631] Wrigley, A., Proc. Mal. Soc. Lond., vol. XXI, p. VI, pp. 361-364, 1935.

Lectotype.—No. 5731, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 707 and 741. Gosport sand: locality 104 (type), fairly abundant.

"Sveltella" turritissima (Meyer) Plate 70, fig. 17

Cancillaria turritissima Meyer, 1886, Geol. Sur. Ala., Bull. No. 1, p. 73, pl. 1, fig. 15 *Cancellaria* in exp. plates; de Gregorio, 1890, p. 48, pl. 3, fig. 27.

Sveltella turritissima (Meyer) Cossmann, 1893, p. 41.

Turrited; the convex whorls very oblique to the axis of the shell; apex obtuse, smooth, the shell otherwise covered with numerous spiral lines, crossed by some transverse, large ribs; aperture semicircular; columella with three folds—the uppermost very prominent, the lowest indistinct; outer lip sharp, striate within at some distance from the aperture.

Locality.—Claiborne, Alab.

The first two embryonic whorls form almost a disk, thus making the apex obtuse. A species similarly distinguished by its very slender form is *Cancellaria Bezanconi,* de Boury*, from the French Tertiary.—[Meyer, 1886].

**Mém de la Soc. Geol.,* 3 me ser., III., 1884, p. 105, pl. 3, fig. 8.

Cossmann placed this apparently rare species in his genus *Sveltella.* It is like the type of the genus, *S. quantula* (Deshayes) of the Paris Basin in the character of the aperture and general shape and sculpture.

The figure by Meyers of this peculiar species is a good representation. The longitudinal folds are stronger on the holotype than illustrated.

Dimensions.—Height, 5.5 mm.; greatest diameter, 2 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: locality 104.

Subgenus **ANEURYSTOMA** Cossmann, 1899.[632]

Genotype by original designation *Cancellaria Dufouri* Grateloup. Miocene. Southern Europe.

Sveltia (Aneurystoma) priama (Harris) Plate 70, figs. 27-29

Cancellaria priama Harris, 1895, p. 49, pl. 1, fig. 2; Wheeler, 1909, Nautilus, vol. 22, No. 10, p. 98.

Nucleus consists of two and a half, smooth whorls, the nucleus minute, the latter whorl enlarged. The sculpture of the postnuclear whorls begins with fine, spiral lines which are crossed by fine, longitudinal ribs. The longitudinal ribs die out and become

[632]Cossmann, M., Essais Pal. Comp., 3 liv., p. 23, 1899.

on the last whorl of the spire and the body whorl, irregular, coarse, lines. The spiral lines increase in strength and become over the later whorls, ribs which alternate in size. The shell consists of five whorls. The whorls are angulated below the suture with a shoulder produced between the angle and the suture. The columella has three plications, the posterior two are larger. The outer margin of the labrum flares slightly as in the type of the subgenus. The inner margin of the labrum is finely crenate.

This rare species is typical of the subgenus *Aneurystoma* Cossmann, the type of which comes from the Miocene of southern France and the Vienna Basin. The only specimens of this species which have been reported in print, are the holotype, which was broken; a specimen by H. E. Wheeler of Alabama and the present three shells. One of the specimens was sent to Prof. Harris by Wheeler and may be the same as the one which he reported. The Harris collection has two better specimens than that which Wheeler sent.

Cossmann[633] reported a Claibornian species under the name *C.* (*Aneurystoma*) *dictyella* Cossmann. The name of Cossmann is a nomen nudum. The species is the same as "*Trigonostoma*" *pulcherrimum* (H. C. Lea) which see.

The distribution of this subgenus is limited as reported by Cossmann, to the Claibornian species, a form from the Eocene of Australian and the type from the Miocene of Europe.

Dimensions.—Height, 13 mm.; greatest diameter, 6 mm.

Holotype.—Broken beyond restoration.

Occurrence.—Gosport sand: locality 104.

Genus **BONELLITIA** Jousseaume, 1887.[634]

Genotype by original designation, *B. bonelli* (Brocchi) [Bellardi]. Miocene-Pliocene. Southern Europe.

Section **BABYLONELLA** Conrad, 1895.[635]

Genotype by subsequent designation Cossmann, 1889[636], *C.*

[633] Cossmann, M., Essais Pal. Comp., 3 liv., p. 24, 1899.

[634] Jousseaume, Le Naturaliste, 2d ser., 9 yr., Dec. 15, p. 223, fig. 5, 1887. Author given as Brocchi. Bellardi is the true author. Fig. 5 is correct.

[635] Conrad, T. A., 1865, p. 32.

[636] Cossmann, M., Ann. Soc. Roy. Mal. de Belgique, t. 24, IV ser. t. 4, p. 227, 1889.

elevata Lea. Eocene. United States.

Bonellitia elevata (Lea) Plate 90, fig. 4

Cancellaria elevata Lea, 1833, p. 141, pl. 5, fig. 139; H. C. Lea, 1848, p. 97; Crosse, 1861, Jour. de Conch., vol. IX, p. 225; Conrad, 1865, p. 32 *Babylonella*; Conrad, 1866, p. 12; de Gregorio, 1890, p. 47, pl. 3, fig. 17; Harris, 1895, p. 13.

Babylonella elevata (Lea) Cossmann, 1889, Soc. Roy. Mal. Belgique, tome XXIV, 4 ser., tome 4, p. 227; Cossmann, 1893, p. 41; Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 35, pl. II, fig. 8.

Snell elevated, turrited, cancellated; substance of the shell rather thin; whorls seven, convex; suture impressed; umbilicus none; mouth ovate, one third the length of the shell; columella with two folds; outer lip striate within.

Length 9-20ths, Breadth .2, of an inch.

Observations.—This pretty little species is remarkably elevated in the spire and beautifully cancellate. A single specimen only was obtained, the outer lip of which is broken. It may be easily distinguished by its elevated spire and cancellate exterior.—[Lea, 1833].

The identity of this species is slightly obscure. In spite of the difficulty of identifying the form by the figures it is hard to believe that the species is the same as *C. alveata* Conrad which has been suggested by authors. The original description of *alveata* states the whorls to be "obtusely angulated" and the description of *elevata* states the whorls are "convex". Cossmann pointed the difference out and type drawings indicate such a difference. Lea's description gave the columella with two plications while the figure shows three. De Gregorio noticed the discrepancy. The Meyer drawing of the type is included herein. The type specimen has only 2 plications. In outline the species appears to be somewhat like *C. parva* Lea but differs in having a slight canal while the aperture of *parva* is rounded anteriorly, the columellar line is straight but the area of the canal is not constricted.

Cossmann, in 1889, designated this species as the type of *Babylonella,* the subgenus which Conrad had in 1865, given to a large number of the Eocene and Oligocene species without differentiating the type.

Dimensions.—Height, 8 mm.; greatest diameter, 4 mm., lectotype.

Lectotype.—No. 5729, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality, 731. Gosport sand: locality 104.

Section ADMETULA Cossmann, 1889.[637]

Genotype by original designation, *C. evulsa* (Solander).

Bonellitia tortiplica (Conrad) Plate 69, fig. 4, 5, 7, 8, 9

Cancellaria tortiplica Conrad, 1865, pp. 32, 145, 211, pl. 20, fig. 8 [not pl. 21, as stated by Conrad]; de Gregorio, 1890, p, 49 [partim]; Heilprin, 1891, p. 397.
Cancellaria evulsa Heilprin, 1880, Acad. Nat. Sci. Phila., Proc. vol. 32, p. 365.
Cancellaria tortiplica Conrad, 1866, p. 13; Harris, 1896, Acad. Nat. Sci. Phila., Proc. vol. 48, p. 475, pl. 20, fig. 10; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 26, pl. 3, fig. 7.
Admete tortiplica (Conrad) Cossmann, 1893, p. 42 section *Admetula*.
Bonellitia tortiplica (Conrad) Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 34.

Subfusiform, with longitudinal narrow ribs and a few thick varices; volutions six, those of the spire convex; regular, prominent revolving lines, six in number, on the penultimate volution, eighteen or nineteen on the body whorl, fine, and crowded near the suture and base; labrum striate within; columella with three sinuous plaits, the upper one large and thick. Length ⅜ inch.
Locality.—Texas.—[Conrad, 1865].

Conrad confused this species and *ellapsa* a nonplicate species, in the reference to plates on p. 215, Amer. Jour. Conch., vol. 1, 1865. He referred under plate 20, to *Tortiplica ellapsa* when he meant *Cancellaria tortiplica.* Under plate 21 he has *C. tortiplica* when he meant *C. ellapsa.* One can verify Prof. Harris[638] correction of Conrad's mistake by examining the figure of pl. 21, fig. 8, and see that it lacks plications which corresponds to the description of *ellapsa.* Prof. Harris believed the figure to be the same as *Paladmete cancellaria* (Conrad).[639] The Meyer drawing of the type of *ellapsa* is here included.

B. tortiplica was listed as the Bartonian species *C. evulsa* Solander by Heilprin in 1880.[640] *B. tortiplica* does belong to the

[637]Cossmann, M., Ann. Soc. Roy. Mal. de Belgique, t. 24, IV ser. t. 4, p. 224, 1889.

[638]Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 26, 1899.

[639]Conrad, T. A., Acad. Nat. Sci. Phila., Jour. 2d ser.. vol. III, p. 333, pl. 35, fig. 8, 1858, *Trichotropis cancellaria;* Gardner, J., Md. Geol. Sur. Upper Cret., p. 413, pl. 18, figs. 14, 15, 1916, *Paladmete.*

[640]Heilprin, A., Acad. Nat. Sci. Phila., Proc., vol. 32, p. 365, 1880; Cossmann, M., Essais Pal. Comp.. 3 liv., pl. II, figs. 6-7, 1899; Cossmann, M., and Pissarro, G., Icon. Coq. Eoc. Env. Paris. tome 2, pl. 47, fig. 212 ter 1, do not seem to represent typical adult specimens. *S. evulsa* is the type of Cossmann's section Admetula, 1889, Ann. Soc. Roy. Mal. Belgique, t. 24, IV ser., t. 4, p. 224.

same genus, *Bonellitia* and section *Admetula,* but is specifically distinct from *evulsa.*

De Gregorio[641] thought *tortiplica* to be the same as the Parisian *C. dubia* Deshayes[642] with priority by Conrad. He made *dubia* a variety as well as another which he named *subevulopsis.* Conrad's figure of *tortiplica* is poor and the type could not be found. Specimens are fairly abundant which Harris interpreted as *tortiplica* Conrad and which is so followed in this report. Additional description is given from specimens from loc. 733.

Shell small, about six volutions; nucleus consists of two and a half to three whorls, smooth, flat on top, globular; apical whorl minute; sculpture of the post-nuclear whorls begins gradually with spiral striations which merge into cancellate ornamentations; whorls sculptured by spiral ribs with a thread-like intervening line; the revolving ribs are crossed by longitudinal costæ which extend the full length of the whorl: six revolving ribs on the penultimate whorl, crowded at both sutures; shell varicated, the varices irregular in size and position so that there may be from one to four or more costæ between the varices; columella with two or three plications; whorls rounded; outer lip striated within.

These specimens are distinguished by the single thread-like line between the spiral ribs. The thread does not always occur on the upper whorls. The interspaces are wide and smooth except for the one. Fine striations and the irregularity of the varices are also characteristic.

Dimensions.—Height, 10 mm.; greatest diameter 6 mm.

Type.—Not found.

Occurrence.—Sabine Eocene: (Harris) Lower Claiborne localities 725, 726, 728, 731, 733 and 734.

Bonellitia garvani, new species — Plate 69, figs. 1-3

Shell small, body whorl broad; nucleus about two and a half, smooth, flattened whorls; apical whorl minute; the apical whorls of the specimens are imperfect but the post-nuclear whorls probably began with the cancellation; varices begin early; whorls of the spire with four revolving ribs, widely spaced and coarser toward the bottom; the spiral ribs occur over the body whorl; the

[641]De Gregorio, A., 1890, p. 49, pl. 3, figs. 28-30.

[642]Deshayes, G. P., Ann. Sans Vert. Bas. Paris, III, p. 105, pl. 73, figs. 25-27, 1864.

interspaces are filled with fine spiral lines usually about three in number; the varices are strong and occur in almost a continuous line from whorl to whorl; five to seven longitudinal costæ occur between the varices, they occur the full length of the whorls; three plications on the columella; outer lip thick and striated within.

This species is distinguished by the regular varices. It differs from *B. tortiplica* (Conrad) in having fine striations within the interspaces of the revolving ribs.

Named in honor of the late Francis P. Garvan, President of the Chemical Foundation, Inc., whose aid to research and humanity has been exceedingly great.

Dimensions.—Height, 12 mm.; greatest diameter, 9 mm.

Syntypes.—Nos. 3294 and 3295, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 136, 729 and 731.

Bonellitia bastropensis (Harris) Plate 73, figs. 23, 27, 28

Cancellaria bastropensis Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 66, pl. 6, fig. 5.

Size and general form as shown in the figure; whorls 7; nuclear whorls 2½, of which two are smooth, and the last half finely cancellated; 4, 5, 6 somewhat irregularly costate, about ten costæ on the penultimate whorl; spiral striæ few and strong on the sides of the whorls, but becoming more closely set and finer on the subsutural region; body whorl with irregular, obtuse costæ crossed by about fourteen spiral lines, strong medially but decreasing in size towards the suture; labral dentes six on a raised ridge; columella with two distinct folds and a rudimentary third below; umbilicus rudimentary.

Locality.—Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

The callus is thin above on the columella and the spiral ribs protrude and appear like plications. The spire is elevated and the spiral ribs lack intervening spiral threads.

Dimensions.—Height 11.5 mm.; greatest diameter, 6.5 mm.

Holotype.—Department of Geology University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 733.

Bonellitia parilis, new species Plate 70, figs. 21-25

Shell small; four whorls excluding the nucleus; nucleus consists of two and a half whorls, small, flattened above; the sculpture of the post-nuclear whorls begins with spiral lines and merges into the cancellate; the ornamentation is composed of well-developed, spiral ribs and longitudinal costæ, which gave a typical, cancellate sculpture to the shell; the interspaces between the ribs are smooth except for fine, growth lines; the intersections of the revolving and longitudinal costæ may become finely nodose; irregular varices occur, some may be continuous from whorl to whorl; there are four, revolving ribs on the whorls of the spire with one or two finer ones crowded at the suture; about twelve, spiral ribs on the body whorl with the ribs crowded at the suture; rarely an intervening, spiral thread occurs between the ribs; there are two, well-developed plications on the columella and a third, smaller one which is formed by the pinched up edge of the anterior margin of the columella, this lower plication protrudes anteriorly while the two above usually lean posteriorly; outer lip crenulated.

This species has the same type of sculpture as *Cancellaria graciloides*[643] and its variety *bella* from the Sabine Eocene in Alabama. One might be inclined to place the middle Eocene form as a variety of the lower but certain basic differences seem to disagree with such a clessification. The Harris collection includes a large number of this species from Moseley's Ferry, Texas. Due to the courtesy of the late T. H. Aldrich, the author has had access to numerous specimens of *B. graciloides* and *bella*. *B. parilis* has consistently in the adult stage one more whorl than the Sabine species. The nuclei of the two forms are of different types. *B. graciloides* has a large, high and pointed nucleus consisting of three or most commonly four whorls. The sculpture of the post-nuclear whorls starts abruptly with the cancellate character of the adult. The nucleus of *B. parilis* consists of about two and a half whorls, flattened above. The sculpture of the post-nuclear whorls does not begin abruptly but starts with the spiral ribs which merge shortly into the cancellate ornamentation. The two species have apertures and plications similar. *B. graciloides* has the plications set more obliquely and the callus on the columella expanded more than *parilis* does at the same type locality. But specimens related to *parilis* from Smithville,

[643]Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 29, pl 3, figs. 10, 11, 1899.

Texas have the plications as on *graciloides*. The Smithville specimens have the sculpture of the shell more sharply defined and lack the varices of the type.

Dimensions.—Height, 10 mm.; greatest diameter, 5.5 mm.

Syntypes.—Nos. 3316, 3317, 3318, 3319, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 138, 723 and 727.

Section **COPTOSTOMA** Cossmann, 1899.[644]

Genotype by original designation *C. quadrata* Sowerby, Barton Eocene. England.

Bonellitia ulmula (Harris) Plate 70, figs. 1, 7, 8

Cancellaria ulmula Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 66, pl. 6, fig. 6.

Size and general form as indicated by the figure; whorls 4; 1, 2 smooth; 3 with seven spiral striæ; body whorl with about eighteen strong revolving lines and an equal number of intercalated fine striæ, lines of growth prominent; columella with two prominent folds on its central portion and a third, rudimetary one below; umbilicus small.

Locality.—Elm Creek, Lee Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

When Cossmann made the section *Coptostoma,* he regarded *Bonellitia* as a subgenus of *Admete*. It seems more reasonable to regard *Bonellitia* as distinct from *Admete*.

Holotype.—Department of Geology, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Elm Creek, Lee Co., Texas. (Type); locality 723.

Genus **CANCELRANA**, new genus

Genotype *Cancelrana finexa* (Harris)=*Pleurotoma* (*Taranis*) *finexa* Harris. Claibornian Eocene. United States.

Shell elongate, nucleus with two or three smooth whorls, flattened on top; cancellated sculpture of the post-nuclear whorls begins abruptly; one and perhaps two plications according to the development of the shell; callus thin, the spiral sculpture may show through on the upper part of the columella; short anterior canal; the whorls carinated about the middle portion of the whorl; shell thin; labrum not thickened on the margin.

[644]Cossmann, M., Essais Pal. Comp., 3 liv., p. 34, 1899.

This genus is known only by the type species. The affinities of the form are probably nearest to *Plesiocerithium* Cossmann,[645] monotype *Cancellaria maglorei* Melleville from the Cuisian of the Paris Basin and to the other species of *Plesiocerithium, C. lanceolata* Aldrich[646] from the Sabine of Alabama. The three species are rare. *Cancelrana* may be more nearly related to *Plesiocerithium* than of generic rank. The closer affinities will be brought out with the discovery of further specimens of *finexa*.

Cancelrana finexa (Harris) Plate 70, figs. 15, 16, 26

Pleurotoma (*Taranis*) *finexa* Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 64, pl. 5, fig. 13; Casey, 1904, Acad. Sci. St. Louis, Trans. vol. XIV, No. 5, p. 169.

Size and general form as indicated by the figure; whorls 6; 2 nuclear, smooth; remaining whorls with (a) a subsutural raised ridge, (b) a strong medial carina, (c) a prominent raised line between the carina and the suture below, (d) fine costæ passing perpendicularly on the lower half of the whorl and obliquely to the left from the carina to the suture above; body whorl bicarinate, between the two carinæ, a strong raised line, below the carina about six raised spiral lines; columella slightly concave; labrum within showing channels and ridges corresponding to the exterior marking.

Locality.—Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum—[Harris, 1895].

Prof. G. D. Harris discovered the second specimen of this species and called the author's attention to the fact that it was not a *Pleurotoma* (*Turris*) as he first believed but that it was a *Cancellaria*. Casey, in 1904, still thought the form was a *Turrid* and noted the uniqueness of its being a *Taranis*. The holotype did not show the columellar plication which is revealed on the specimen in the present collection. The specimen of this report has the edge of the callus slightly broken and a portion of an umbilicus is shown which would not normally be seen. The umbilical area in the holotype is completely covered. The difference between the umbilical area of the two specimens indicates variation in the extent of the callus.

Dimensions.—Height, 8 mm.; greatest diameter, 3.5 mm.

Holotype.—Geological Department, University of Texas, Aus-

[645]Cossmann, M., Roy. Soc. Mal. Belg., Ann., t. 24, 4 ser., t. 4, p. 228, 1889.

[646]Aldrich, T. H., Nautilus, vol. XI, p. 27, fig., 1897; Harris, G. D., Bull. Amer. Pal., vol. III, No. 11, p. 27 pl. 3, fig. 8, 1899.

tin, Texas.

Occurrence.—Lower Claiborne: locality 733.

Section **MERICELLA** Thiele, 1929.[647]

Type by monotypy *Cancellaria* (*Mericella*) *jucunda* Thiele.

Cancellaria sotoensis Aldrich Plate 70, figs. 5, 14

Cancellaria ? sotoensis Aldrich, 1908, Nautilus, vol. XXII, No. 8, p. 74, pl. V, fig. 3.

Shell small, whorls about seven, the first two and a half embryonic and smooth, the cancellation beginning on the second half of the third whorl; the remaining whorls strongly cancellated, the body whorl contains 12 spiral lines, while the longitudinals are nearly three times as many; slightly nodular at the intersection points, suture very deep. Whorls strongly rounded. Base somewhat rounded. Aperture oblong, outer lip denticulated within, inner lip rather twisted, and carrying a small fold near the base. Umbilicus not entirely closed.

Length.—8 mm.; width body whorl 3 mm.

Locality.—De Soto, Miss. Claibornian.

Remarks.—This little shell is more slender in shape than the drawing shows, and the suture is much more deeply impressed. It has somewhat the aspect of a *Scala.*—[Aldrich, 1908].

The original figure does not bring out the true character of ornamentation. Through the courtesy of Prof. E. W. Berry, Johns Hopkins University, the holotype was loaned to photograph. The illustration is included.

At the intersection of the longitudinal and spiral ribs there is a definite, fine node giving the whole a beaded appearance. The labrum is crenate within. The species bears a striking resemblance to a species for which Thiele creates a new section of Concellarias.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Nomina Nuda

Cancellaria minuta Harris in Kennedy, 1895, Proc. Acad. Nat. Sci., Phila., vol. 47, p. 130 and in Deussen, 1914, U. S. Geol. Sur., Water Supply Pap., No. 335, p. 57.

Cancellaria alvaniopsis Harris in Cossmann, 1899, Essais Pal. Comp., 3 liv., p. 34. It may be a confusion of authors or names on the part of Cossmann.

[647] Thiele, Johannes, 1929, p. 352, text fig.

Family CONIDÆ

Genus CONUS Linnæus, 1758.[648]

Genotype by subsequent designation, Children, 1823,[649] *Conus marmoreus* Linnæus. Living. Indo-Pacific.

Subgenus LITHOCONUS Mörch, 1852.[650]

Genotype by subsequent designation, Cossmann, 1889,[651] *Conus millepunctatus* Lamarck. Living. Indo-Pacific.

Conus (Lithoconus) sauridens Conrad Plate 71, figs. 1-14; Plate 90, fig. 3

Conus sauridens Conrad, 1833, Aug., p. 33; Conrad, 1834, App. in Morton, p. 5; Conrad, 1835, p. 38, pl. 15, fig. 7; H. C. Lea, 1848, p. 98; d'Orbigny, 1850, p. 356; Conrad, 1865, p. 30; Conrad, 1866, p. 13; de Gregorio, 1890, p. 21, pl. 1, figs. 61-63; Heilprin, 1891, p. 394 [partim]; Cossmann, 1893, p. 42; Harris, 1895, p. 40; Dall, 1895, U. S. Nat. Mus. Proc., vol. 18, p. 41; Stenzel, 1931 in Renick and Stenzel, 1931, Univ. Texas Bull. No. 3101, pl. VI, fig. 6.

? *Conus clairbornensis* Lea, 1833, Dec., p. 186; Harris, 1895, p. 11, No. 5931, A. N. S., Philadelphia. Specimen lost before figured or description completed.

Conus parvus H. C. Lea, 1840, Amer. Jour. Sci., vol. XL, p. 103, pl. 1, fig. 24, young; Dall, 1895, l. c., p. 41; Cossmann, 1893, p. 42, [partim]; non *C. parvus* Borson, 1820.

Conus tortilis Conrad, 1854, Wailes Agr. Geol. Miss., pl. 15, fig. 5; Conrad, 1855, Acad. Nat. Sci. Phila., Proc. VII, p. 260; Conrad, 1865, p. 30; Dall. 1895, l. c., p. 41.

Conus alveatus Conrad, 1865, pp. 30, 148, pl. 11, fig. 4; Dall, 1895, l. c., p. 41.

Conus subsauridens Conrad, 1865, pp. 30, 148, pl. 11, fig. 9; Conrad, 1866, p. 13; Dall, 1895, l. c., p. 42.

Conus diversiformis de Gregorio, 1890, p. 21, pl. 1, fig. 68, non Deshayes, 1835.

? *Conus deperditus* var. *subdiadema* de Gregorio, 1890, p. 20, pl. 1, figs. 56, 57, 58.

Conus (*Lithoconus*) *sauridens* (Conrad) Cossmann, 1896, Essais Pal. Comp., 2 liv., p. 158.

Shell smooth except at base, which is obliquely striated; whorls of the spire flattened, striated; apex pointed; mouth narrow; shoulder angular. Length 1 inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Thin and fragile, smooth, with impressed spiral striæ at base; sides straight; spire short, slightly concave, with spiral striæ; suture carinated; shoulder angulated; columella folded at base.

648Linnæus, C., 1758, p. 712.

649Children, J. G., in Kennard, A. S., Salisbury, A. E., Woodward, B. B. 1931, p. 35.

650Mörch, O. A. L., 1852, p. 66.

651Cossmann, M., Soc. Roy. Mal. de Belgique, Ann. tome 24, IV ser. tome 4, p. 232, 1889, designation earlier than 1896 as stated by Woodring, 1928.

Locality.—Claiborne, Alab.
Rather rare, and remarkable for the tenuity of the shell and the fold on the columella. No. 3, first ed. p. 33.—[Conrad, 1833].

Nucleus consists of three or four smooth whorls, elevated; the first six to eight post-nuclear whorls are nodose, the nodes occurring on the lower portion of the whorl with the whorl angulated along the upper margin of the nodes; the whorls of the spire have fine, spiral striæ, the average number of spiral striæ is four or five but the number on older specimens increases to seven or eight; spiral striæ occur at the base of the body whorl; the number and character of the basal grooves varies; the grooves are closer together anteriorly, with the width of the interspaces increasing toward the middle of the body whorl and the surface becoming smooth over the upper portion of the whorl; the amount of basal grooves and corresponding ridges or striations varies; many young specimens 5 mm. or so in height show the wide interspaces over the whole surface of the body whorl—some large, immature specimens of 35 mm. show the wide interspaces conspicuously over most of the whorl with a slight trace of the remaining lines; in the Harris collections, the *tortilis* specimens illustrate such a condition; this may be accounted for by the fact that *tortilis* represents the maximum growth of the species; large Vicksburg specimens of 90 mm. or more have the spiral lines on the surface of the body whorl completely obliterated; specimens of *tortilis,* smaller than the maximum size at Vicksburg might correspond to mature specimens at the localities where the species does not attain such a large size.

There is considerable variation in the shape of the species but there seem to be two phases more persistent than others which extend through the range of the stock. At the type locality, in the Gosport sand at Claiborne, Ala., the spire is commonly lower. Conrad figured a low spired shell. The first four to six whorls of the spire are flatter and there is a slight increase in altitude, the remaining apical whorls rise abruptly from the lower whorls. The other phase which is probably the more common throughout the range, has the whorls of the spire increasing regularly in elevation. There is considerable and inconstant variation in the angulation of the whorls

After an examination of a large number of specimens of the stock of *Conus sauridens* from the lower Claiborne, Gosport sand, Jackson and Vicksburg localities with a tabulation of the characters of the shell, a consistent character is not found which can be limited to a group of the specimens which have different names.

From the lower Claiborne, Conrad named *C. subsauridens* but the difference in form is not constant enough to warrant separation by name.

The included table of characters taken of specimens throughout the range of the species will show that the characters are inconstant for a locality but constant when those of the four horizons are compared. The number of spiral striations on the whorls of the spire may vary from four to eight but that variation occurs on the Claiborne forms, on the Jackson and on the Vicksburg shells. The larger number of striations seems to occur on the Gosport and Jackson shells. While the usual number of post-nuclear whorls is eight, there may be as many as eleven. Such variation is found at different ages of the shell. The subsutural flexure appears similar throughout the life history. Conrad named the shell of the Jackson phase of development of the species, *tortilis*. The species reached its greatest development in size and abundance in Jackson time.

The Vicksburg shells of the species were named *alveatus* by Conrad. From a tabulation, one may see that the characters with which Conrad differentiated *alveatus* from *sauridens* do not hold. Under *C. protractus* Meyer the difference is discussed between a small species of cone found associated with *alveatus* and the young of *C. sauridens* Conrad as found elsewhere.

The *C. parvus* H. C. Lea is the young of *sauridens*. Lea described the characteristic, spiral striations and longitudinal nodes of the young conch. Dall[652] suggested *granopsis* de Gregorio might be the young of *sauridens*. *C. pulcherrimus* Heilprin[653] is a Turrid as Meyer[654] listed in 1887 and as verified by Harris, 1895.

[652]Dall, W. H., 1895, l. c., p. 42.

[653]Heilprin, A., Acad. Nat. Sci. Phila., Proc. vol. 31, p. 213, pl. XIII, fig. 8, 1879.

[654]Meyer, O., Bericht Senck. natur. Gesell. Frankfurt a. M., p. 18, 1887.

Harris identified the form as an *Eosurcula*. The species is discussed p. 40, Pal. Amer., vol. II, No. 7, 1937.

De Gregorio believed *sauridens* to be the same as the Parisian *diversiformis* Deshayes. As Dall, (1895) pointed out, Conrad's name has priority. The date of Deshayes work is 1835[655] in place of 1824 as given by De Gregorio. The European species and the American bear a close resemblance, but there are slight differences which are hard to discriminate but probably exist. Dall pointed out a difference in the size of the aperture, character of the shell and occurrence of the plait in *sauridens*. With the exception of senile forms in the Jackson, the columellar plait is not developed more in the average specimen of *sauridens* than on the French specimens.

In a large collection of *C. sauridens* collected by John W. Wells, from loc. 766, and John E. Adams, (loc. 727) Crockett formation[656], lower Claiborne, Little Brazos River, Texas all the variations and more of the shape of the adult spire which have been given names in higher horizons are present. The different variations in shape of *sauridens* and specimens from the 4 stratigraphic groups representing its growth are figured on plate 71. Of these figures, the elevated, convex shape of the spire of *tortilis* (Jackson) pl. 71, fig. 14, is duplicated by numerous specimens in the 766 loc. collection. The low spire, concave tip as represented by Conrad's figure is common at the same locality. Specimens like fig. 7, pl. 72, *alveatus* (Vicksburg) is present. The most common shape is that of fig. 3, pl. 72.

The Conradian collection of *sauridens* consists of 5 specimens. The specimen figured by Conrad is the only one of the 5 which has a low spire. It is also the only one from the Gosport sand. The other four have a matrix of light sand and mud.

The type of *Conus subsauridens* Con. is also on the card with the *Conus sauridens* collection. It has a red, silicified matrix resembling that of the Orangeburg, S .C. material.

The specimen drawn by Meyer (included herein) as type is not the same shell as that figured by Conrad.

[655]Newton, R. Bullen, 1891, p. 309; *C. diversiformis* is on p. 747 of Deshayes, G. P., Coq. foss Paris, tome 2, 1835.

[656]Plummer, F. B., Univ. Texas Bull. No. 3232, p. 657, 1933; Stenzel, H. B., Univ. Texas Bull. No. 3501, p. 271, 1936.

	LOWER CLAIBORNE	GOSPORT	JACKSON	VICKSBURG
nucleus		smooth- 4 whorls, elevated	smooth- 4 whorls, elevated	smooth- elevated
young, 5-10 mm.	revolving striations			
immature	basal grooves close or wide interspaces	many wide basal interspaces	basal grooves commonly with interspaces	basal grooves close or wide interspaces
apical whorls	nodose	nodose	nodose	nodose
spiral striations	4-5	5-8	4-7	4-5
no. post nuclear whorls	8-10	8	7-11	8-11

COMPARISON OF SPECIMENS OF *C. SAURIDENS*

Dimensions.—Height, 75 mm.; greatest diameter, 45 mm. (largest Claibornian specimen). Height 95 mm.; greatest diameter 60 mm., (largest specimen *tortilis*) Height, 34 mm.; greatest diameter, 18 mm., lectotype *C. subsauridens* Con. Height, 6 mm.; greatest diameter 3 mm., lectotype *C. parvus,* H. C. Lea. (fragment).

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 13161, A. N. S. lectotype *C. parvus* H. C. Lea; lectotype *C. subsauridens* Con. A. N. S.

Occurrence.—Lower Claiborne: localities 138, 707, 708, 723, 724, 725, 727, 728, 730, 731 and 766. Gosport sand: locality 104 (type). Jackson: Bunker Hill Ldg., Ouachita R., 1 mile above Gibson's Landing and Montgomery, La. Vicksburg Oligocene: Vicksburg, Miss.

Conus (Lithoconus) protractus Meyer Plate 73. fig. 18

Conus protracta Meyer, 1885, Amer. Jour. Sci., vol. 29, 3d ser., pp. 466, 468 *protracta;* Meyer, 1886, Geol. Sur. Ala., Bull. No. I, pt. 2, p. 75, pl. 2, fig. 7 *protractus.*

Spire nearly a third of the entire length; four smooth, rounded, embryonic whorls are followed by seven carinated volutions; the carina is somewhat crenulated; base with numerous broad, depressed lines.

Localities.—Vicksburg, Miss., Red Bluff, Miss.

Young specimens of *Conus sauridens,* Conn., resemble the species, but their spires are concave and covered with revolving lines, which are absent in *C. protractus.*—[Meyer, 1886].

Associated with "*C. alveatus*" Conrad (=*sauridens*) in the Vicksburg are small specimens of a cone which may be confused with the young of *alveatus* (=*sauridens*). Meyer differentiated the form as a distinct species. Dall thought the shells were the young of "*alveatus*". On careful examination of the apical whorls under the microscope one finds that there is a constant and distinct difference between the specimens and the young of *sauridens* (*alveatus*) as seen elsewhere. Since specimens from Vicksburg of *protractus* up to 20 mm. in height show the same character and the adult of *alveatus* is typical of *sauridens,* Meyer was probably right in separating and making a new species in the Vicksburg, which he called *Conus protractus.* Meyer clearly described and illustrated the distinguishing characters between the two forms. *C. protractus* lacks the revolving lines on the whorls of the spire. The striations are well developed, throughout the life history of *Conus sauridens. Conus protractus* is apparently a smaller, rarer form as one finds few, large specimens.

The *Conus* (*Conospira*) *granopsis* of de Gregorio, 1890, p. 21 has the characters of *protractus* which Dall suggested it might be. Since *protractus* as known so far is from the Vicksburg, one hesitates to include De Gregorio's shell which is from Claiborne according to De Gregorio.

Dimensions.—Height, 18 mm.; greatest diameter, 8 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Vicksburg Oligocene.

Conus (Lithoconus) smithvillensis Harris Plate 73, figs. 17, 21

Conus smithvillensis Harris, 1895, Acad. Nat. Sci. Phila., Proc., vol. 47, p. 55, pl. 4, fig. 2.

General form as figured; whorls about 12; smaller spiral whorls costate or crenulated; penultimate whorl smooth; body whorl smooth, except about 12 revolving lines at base.

This species bears much resemblance to the figure given in Proc. Ac. Nat. Sci. Phila., 1879, pl. 13, fig. 8, of "*Conus*" *pulcherrimus* Heilp., but upon examining the type of this species now in the Amer. Mus. Nat. Hist., N. Y. City, it was found to be, as already stated by Meyer, a Pleurotomoid shell. *C. parva* of H. C. Lea is evidently the young of *sauridens* Con.

Locality.—Smithville, Bastrop Co., Tex.

Type.—Texas State Museum.—[Harris, 1895].

This species differs from *C. sauridens* in being much narrower, with a higher spire.

The nucleus consists of four, smooth, elevated whorls. The whorls of the spire have four, revolving striations crossed by coarse lines of growth.

Dimensions.—Height, 22.5 mm.; greatest diameter, 9 mm.

Holotype.—Formerly at the Geology Department, University of Texas, Austin, Texas. Probably lost.

Occurrence.—Lower Claiborne: localities 733 and 767.

Conus granopsis de Gregorio Plate 73, figs. 19, 20

Conus (*Conospirus*) *granopsis* de Gregorio, 1890, p. 21, pl. 1, figs. 66-67.

De Gregorio described this small cone from Claiborne and placed it in his new subgenus *Conospirus*, the type of which is *C. antediluvianus* Bruguière[657], from the later Tertiaries of southern Europe. The specimen is small and may probably be the young of some other species.

Holotype.—De Gregorio home, Via Molo 132, Palermo, Sicily.

[657]See Hörnes, M., 1856, p. 38, pl. V, figs. 2, a, b, d, e.

Doubtful Species

The *Conus improvidus* de Gregorio, 1890, p. 20, pl. 1, figs. 59-60, is of doubtful status as an American species. Nothing like it has been found in the Claiborne collection.

The *Conus gyratus* Morton, 1833, Amer. Jour. Sci., vol. 24, p. 131, pl. X, fig. 13 is an internal mold and therefore indeterminable specifically. It was described in Morton, 1834, Syn. Org. Remains Cret. Group, etc., p. 49, pl. X, fig. 13. It was found in the Eocene of South Carolina.

Conus pulcherrimus Heilprin, 1879 is a young Turrid. See Harris, "Turrid Illustrations", Pal. Amer., vol. II, No. 7, p. 40, 1937. The type of the species is in the American Museum of Natural History, New York City, catalogue No. 5704/1[658].

Family **TURRIDÆ**

The Claibornian Turridæ have been studied and the data published by G. D. Harris in "Turrid Illustrations; Mainly Claibornian", Paleontographica Americana, vol. II, No. 7, 122 pp., 14 plates, 1937.

Family **TEREBRIDÆ**

Genus **TEREBRA** (Bruguière, 1789)[660] Lamarck, 1799.

Genotype by monotypy Lamarck, 1799, *Buccinum subulatum* Linné. Living. Indo-Pacific.

Terebra ziga de Gregorio Plate 72, figs. 1, 7, 21

Terebra ziga de Gregorio, 1890, p. 17, pl. 1, figs. 47, 48; Cossmann, 1893, p. 48.

? *Terebra ignara* de Gregorio, 1890, p. 18, pl. 1, fig. 49.

Testa conoidea, apici acuminata; costis axialibus, regularibus, circiter 18, conspicuis; filis spiralibus; sulco posteriore profundo costas non secante sed solum per interstitia decurrente; apertura angusta semilunari; columella tenue uniplicata. Larg. 12m Ang. sp. 20°.

Cette espèce est analogue des deux précédentes, ma elle en est distinguée par l'ornementation, par l'angle spiral et par la forme des tours. Les côtes sont plus marquées, elles ne sont pas coupées par le sillon postérieur qui est enfoulé dans les intervalles. L'angle spiral est un peu plus large, néanmoins l'extrémité de la spire est très aiguë.

Cette espèce a beaucoup d'analogie avec la *T. costata* Lea, mais celle-ci, selon la description et la figure de Lea (Contr. Geol. p. 166, pl. 5, f. 172), est pourvue de 2 plis columellaires au lieu que d'un pli seulement. Ce

[658] Whitfield, R. P. and Hovey, E. O., 1901, p. 452.

[659] Dall, Wm. H., Bull. Mus. Comp. Zool., vol. 43, pp. 245-254, 1908; Dall, Wm. H., Nautilus, vol. 21, pp. 124, 125, key, 1908; Bartsch, Paul, Nautilus, vol. 37, No. 2, pp. 60-64 key, 1923.

[660] Bruguière, J. G., 1789, vol. "6" (1), p. XV, fide Stewart, 1926, p. 424 footnote.

caractère ne serait pas suffisant pour justifier la proposition d'une nouvelle espèce, mais il y a d'autres différences. Dans le exemplaires de Lea il y a des stries spirales qui coupent les côtes, tandisque dans nos exemplaires il y a des filets qui passent même sur les côtes ne les coupant pas; dans nos exemplaires il y a un gros sillon près de la suture postérieure, qu'on ne voit pas dans celui de Lea. En outre les sutures de nos exemplaires ne sont pas *furrowed.*—(Coll. Mon Cabinet).—[De Gregorio, 1890].

Holotypes.—De Gregorio home, Via Molo 132, Palermo, Sicily.

Occurrence.—Claiborne, Ala.

TEREBRELLA, new subgenus

Genotype *Terebra mirula* de Gregorio (=*Terebra texagyra* Harris). Claibornian Eocene. Southern United States.

Shell medium-sized; slender; nucleus of three and a half or four smooth whorls; aperture ovate, elongate below; canal extended, twisted without a shortened notch; the columella is twisted but there is no distinct fold; sculpture discrepant in young and adult; the axial sculpture is well developed in the young and immature, becoming obsolete in the adult; the subsutural band is absent or with only a slight indication in the young while in the adult it is well developed.

This group is like *Hastula* in that the young is without a subsutural band and has axial ribbing. In *Hastula* the subsutural band does not develop in the adult and the axial ribbing of the young is persistent. *Hastula* has no canal. The anterior portion of the aperture has a deep notch while in *Terebrella* a canal exists.

Terebrella is like *Subula*[661] in that axial ribbing occurs in the young but does not persist in the adult stage. *Subula* has the subsutural band in the young as well as in the adult while in *Terebrella* it occurs only on the older shells.

The author agrees with Woodring[662] that "it is difficult to apply" the criterion which Bartsch used to divide the *Terebridæ,* i. e. the presence of one or two folds. Many specimens have only a columellar swelling. In some cases as in *Terebrella* one doubts that a matter of personal opinion would justify stating that a fold exists, in the sense it is used in the other genera of the *Terebridæ.* This uncertainty is in agreement with that expressed by Wood-

[661]Schumacher, C. F., 1817, p. 233. Genotype by subsequent designation, Gray, 1847, *Buccinum dimidiatum* Linné. Recent. Western Pacific.
[662]Woodring, W. P., 1928, p. 134.

ring. In all cases of *Terebra* as well as in other plicate forms the outer lip should be fractured or specimens with broken apertures examined in the columellar region. Many folds obscure on the outermost margin become pronounced inwardly.

Examining under the binoculars specimens of *Terebra texagyra* which have the aperture broken one sees a probable indication of the incipient stage of a columella fold.

Terebra (Terebrella) mirula de Gregorio   Plate 72, figs 8, 10, 11, 16-20

Terebra mut. *mirula* de Gregorio, 1890, p. 17, pl. 1, figs. 45, 46; Cossmann, 1893, p. 48.
?*Terebra andrega* de Gregorio, 1890, p. 17, pl. 1, figs. 43-44; Cossmann, 1896, Essais Pal. Comp., 2 liv., p. 50 [section *Myurella*]. .. ..
Terebra inula de Gregorio, 1890, p. 18, pl. 1, 50- 51; Cossmann, 1893, p. 48, young.
Terebra (*Acus*) *mirula* Dall, 1895, U. S. Nat. Mus., Proc., vol. 47, p. 33.
Terebra texagyra Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 54, pl. 5, fig. 10.
Terebra divisura Conrad var. Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. IX, p. 49 [partim].

Testa subcylindroides, magna; primis anfractibus tenue plicatis, ultimis laevigatis, striis oblique arcuatis ornatis; sulco spirali potius notato; columella uniplicata. Long 50 *mm. Ang. sp.* 12°.

Cette espèce a quelque ressemblance avec la *Ter. andrega*, mais elle en diffère par sa taille et par son ornementation. Les plis sont plus faibles et réduits aux permiers tours. Les derniers 6 tours sont lisses, les plis disparaissent et sont substitués par des stries d'accroissement, qui ont la même démarche que les plis. En outre il y a quelque variee très oblitérée, large, presque pas visible. Le sillon près de la suture postérieure est moins profound que dans la *Ter. andrega* De Greg. Les tours sont très nonbreux, environ 15.

Cette espèce est analogue de la *T. divisurum* Con. (1850. Con. Observ. on Eoc Form. Vicksburg p. 114, p. XI, f. 13), mais elle en est distinguée par plusieurs caractères: ses tours en effet sont plus réguliers, ou pour mieux dire, moins obliques tandisque les sutures de la *divisurum* sont très courbées, comme on peut le voir d'après la figure de Conrad; le dernier tour, à la base, est moins développé que dans la *divisurum;* les côtes sont limitées aux premiers tours, les cinque derniers tours sont lisses, on n'y voit que les signes d'accroissement; pendant que dans la *divisurum* les côtes es prolongent jusqu'au dernier tour. Malgrè tout cela ce sont deux espèce très voisines et il pourrait arriver qu' on dut les considérer comme des formes de même groupe. Mss Meyer et Aldrich citent la *Pl. divisurum* (The tert. Fauna Newton p. 12) en échangeant la terminaison en *divisura*. Ils lui donnent pour *habitat* non seulement Claiborne mais Newton, Wautubbee, Lisbon, Wheelock, Jackson.

(Coll. mon Cabinet).—[De Gregorio, 1890].

Nucleus consists of about three and a half, smooth whorls. Well-developed, longitudinal ribs begin on the post-nuclear whorls. They occur over the full length of the whorl and occur on all the whorls of the young and immature specimens. Such specimens to 10-15 mm. in length rarely show more than a trace of the subsutural band which is pronounced in the adult. There is an absence of spiral lines on all stages of growth. Other characters of the species have been brought out in the original descriptions by De Gregorio and in Harris and in the description of the new genus.

This species is commonly known by the name *texagyra* given by Harris. On comparison with the figures and notes of the form which De Gregorio called a mutation *mirula* as well as that of *inula* de Gregorio, the three seem to be the same. De Gregorio's name has priority. *Andrega* de Gregorio may also be a medium stage of the species or it may be *T. polygyra* Conrad.

The Vicksburg Oligocene species *tantula* and *divisura* of Conrad are involved in the working out of *mirula-texagyra* problem. One feels that Dall in his discussion in 1893 of the *Terebra* species did not fully understand the change in character from the young to adult stages of the Eocene species. Dall referred *mirula, andrega, divisura, tantula* as well as *polygyra* to *Acus* Gray not Edwards. He[663] later substituted *Oxymeris* for the preoccupied name of Gray. According to Bartsch's key of the Terebridæ the subsutural band in *Oxymeris* is present only on the young specimens. The reverse is true in *mirula* (*texagyra*). There is only a trace of a band on young individuals. The subsutural band is strong on all the later whorls of fully developed specimens of *mirula*.

T. divisura and *T. tantula*[664] have similar large nuclei of four or five whorls. *T. divisura* has strong longitudinal ribs in the young which become obscure on the adult. The subsutural band is prominent during its life history. The form has one good fold. *T. tantula* has an obscure fold which is more clearly seen when the outer lip is broken back. *T. tantula* has strong longitudinal

[663]Dall, Wm. H., Proc. U. S. Nat. Mus., vol. 26, No. 1342, p. 951, 1903, note in the synopsis of Astartidæ.

[664]Conrad, T. A., Acad. Nat. Sci. Phila., Jour. 2d ser. I, p. 114, pl. XI, fig. 13 *divisura;* p. 114, pl. XI, fig. 15 *tantula*.

ribs throughout development. The subsutural band is obscure on the first two whorls, increases in size and becomes prominent on the adult.

Making the description of the nucleus of the species from large numbers of specimens of *texagyra* Harris, one finds that the nucleus of *texagyra* differs from *divisura* and *tantula* in being smaller and consistently being a whorl shorter. The longitudinal ribs are strong on the young and disappear on the adult. In that character *mirula* (*texagyra*) is like *divisura*. The subsutural band begins earlier in *divisura* than in *mirula*. There is no strong fold in *mirula*. In both *mirula* (*texagyra*) and *divisura* the last five whorls lack longitudinal ribs. The last whorl in the Claiborne form is more developed than in *divisura*. When *inula* de Gregorio is compared with the young specimens of "*texagyra*" and when De Gregorio's remarks concerning the form are considered, *inula* de Gregorio appears to be the young of *mirula*. *Andrega* de Gregorio suggests an intermediate stage of *mirula*. *Andrega* according to nomenclatural rules would have page preference over *mirula* but as that rule is only a recommendation *mirula* is selected to stand for the species because there is less doubt as to its status.

This species is common in the lower Claibornian of Texas.

Dimensions.—Height, 22 mm.; holotype of *texagyra*.

Holotype.—(*Mirula*) De Gregorio home, Via Molo 132, Palermo, Sicily. (*Texagyra*) Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: Texas type (*texagyra*); Wautubbee and Newton, Miss. (Meyer and Aldrich); localities 725, 727, 733, 734 and 743. Gosport sand: locality 104 (type *mirula*).

Terebra (Terebrella) polygyra (Conrad) Plate 72, fig. 15

Terebra polygyra Conrad, 1834, Acad. Nat. Sci. Phila., Jour. 1st ser., vol. VII, p. 156; H. C. Lea, 1848, p. 106; Harris, 1895, p. 36.
Terebra (*Acus*) *polygyra* (Conrad) Dall, 1895, U. S. Nat. Mus., Proc. vol. 18, pp. 33, 36.

Shell subulate; sides of the whorls perfectly rectilinear, angular near the suture, angle crenulated, beneath which is an impressed spiral line; whorls near the apex longitudinally striated.

Length, one inch and one-eighth.

Locality.—Claiborne, Alabama.—[Conrad, 1834].

Conrad described the species but never figured it. Dall included the form under *Acus* Gray (now *Oxymeris* Dall). Such an arrangement is not agreed with in this report and the change is discussed under *T. mirula* de Gregorio. Dall placed *andrega* and *ignara* de Gregorio as mutations of *polygyra*. *Andrega* may belong to the species.

Through the cooperation of Miss Helen Winchester, Academy of Natural Sciences, a photograph of the holotype of this species is included.

Dimensions.—Height, 27 mm.; greatest diameter, 6 mm., holotype.

Holotype.—Academy of Natural Sciences, Philadelphia, Pa.

Genus HASTULA H. and A. Adams, 1853.[665]

Genotype by subsequent designation, Woodring, 1928[666], *Terebra strigilata* (Linn.) Living. Indo-Pacific.

"Hastula" venusta (Lea) Plate 72, figs. 2, 5, 9

Terebra venusta Lea, 1833, p. 167, pl. 5, fig. 173; H. C. Lea, 1848, p. 106; Conrad, 1865, p. 28; Conrad, 1866, p. 14; de Gregorio, 1890, p. 16, pl. 1, figs. 40-42; Cossmann, 1893, p. 47.
Terebra perlata Conrad, 1834, App. in Morton, p. 5 not described; d'Orbigny, 1850, p. 369.
?*Terebra mitis* de Gregorio, 1890, p. 18, pl. 1, figs. 52,53.
Terebra (*Hastula*) *venusta* (Lea) Dall, 1895, U. S. Nat. Mus., Proc. vol. '18, p. 33.

Shell subulate, very much attenuated, with close longitudinal ribs and minute transverse striæ in the intermediate spaces; substance of the shell thin; spire very much elevated, acutely pointed; suture linear; whorls fifteen, flattened; mouth narrow; columella smooth; outer lip—.
Length 13-20ths, Breadth 3-20ths, of an inch.
Observations.—A very distinct species from the above, being more attenuate, having a smooth columella, and being more closely ribbed. The transverse striæ, intermediate between the ribs, are very minute, while in the above two species they are larger and cross the ribs.—[Lea, 1833].

The nucleus of the species consists of four smooth whorls, attenuate. The development of longitudinal ribs begins weakly and develops gradually into pronounced ribs on the fifth whorl. Typically in the Gosport sand, the species does not have a subsutural groove but on some young or medium specimens from the lower Claiborne there is irregularly a suggestion of a sutural band. A

[665]Adams, H. and A., 1853, vol. I, p. 225.
[666]Woodring, W. P., 1928, p. 143.

slight constriction of axial ribs occurs which gives the ribs a nodose character above the line. Many of the longitudinal ribs may be pinched without forming a linear constriction below. A suggestion of a similar condition is found on Hastulas identified by Sacco[667] from the Tertiary of Italy. Numerous microscopic, transverse striæ occur between the longitudinal ribs. Longitudinal ribs become less pronounced on the body whorl of mature specimens.

Lectotype.—No. 5853 (broken), Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality 708. Gosport sand: locality 104 (type).

Hastula houstonia (Harris) Plate 72, figs. 12-14

Terebra houstonia Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 55, pl. 3, fig. 1, pl. 4, fig. 1; Dall, 1895, U. S. Nat. Mus., Proc. vol. 18, p. 34.

Terebra polygyra Heilprin non Conrad, No. 6034, U. S. Nat. Mus. specimen.

Size and general form as indicated in the figure; whorls 12 or 13, longitudinally ribbed, the ribbing being much coarser in the upper part of the shell than in the lower; suture margined below by an obscurely impressed revolving line; columella straight, smooth, tapering rapidly.

This species is characterized at once by the height of its whorls in comparison to their respective diameters, the bulging sides of the whorls, the irregularities of the ribbing, and the straight, smooth columella.

Localities.—Smithville, Bastrop Co.; near McBee's school-house, Cherokee Co.; Little Brazos River, near iron bridge, on Mosley's Ferry road; Cedar Creek, Wheelock League, Robertson Co.; Elm Creek, Lee Co.; near Crockett and 2 miles west of Crockett, Houston Co.; Collard's farm, Sparks' Headright, Brazos Co.; Arnold's Ranch, Frio Co.; southeast of Campbellton, just south of Lipan Creek, Atascosa Co. Also in Claiborne, Webb, and Bienville Parishes, La.; 2 miles east of Newton, Miss.; Claiborne, Ala.; 2 miles west of Orangeburg, S. C.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Nucleus consists of three and a half or four, smooth whorls, flattened at the first. Longitudinal ridges begin on the post-nuclear whorls and continue prominently developed over the upper portion of the shell and over the whole surface of immature shells. On adult shells the longitudinal ribs become obscure but increase in number on the last whorls. Many specimens have a portion of the body whorl smooth. Irregularly, more commonly on the first whorls the upper tips of the longitudinal ribs become

[667]Sacco, F., I Molluschi dei terreni terziarii del Piemonte a della Liguria, pt. X, p. 50, 1891.

pinched into a nodose condition. That area becomes margined along the lower line forming an obscure, subsutural band. The condition is not constant. It may be slightly developed on a few whorls or it may occur in such a consistent condition as illustrated by Prof. Harris's second figure.

The author has had access to a large suite of specimens from the original Harris collection, loaned by the University of Texas. Such a series reveals the sequence of development and shows that the specimens with and without the sutural band belong to the same species.

This species is closely related to *H. venusta* (Lea). The longitudinal folds are finer in *H. venusta*. The subsutural band is stronger and more frequently developed in *houstonia*. Commonly in *houstonia* the tips of the longitudinal ribs are nodose above the subsutural band.

T. mirula (*texagyra*) on first examination might be confused with *houstonia*. The differentiation of the two species may be made best on the character of the columella. The columella in *H. houstonia* is straight and the line continuing straight with the short canal while in *mirula* the line of the columella is curved and swings to the left with the short, curved canal. Dall placed the *mitis* and *inula* of De Gregorio under *houstonia*. From the illustrations of De Gregorio's species, the character of the columella and canal does not verify such determination.

This species in its transitional phases is not typical *Hastula* as described by authors but it is a much more interesting form than if it conformed to type. The initial development of the nodose, subsutural band probably shows the relationship of the *Hastula* type to that with the well-developed band.

If the *T. strigilata* of Linnæus is not the same as that of Lamarck as pointed out by Woodring[668] then the designation of type of *Hastula* was not made until that of Woodring. Cossmann's[669] designation of *T. strigilata* Lam. is not the species included in the original description by the Adamses. Linnæus species was given

[668]Woodring, W. P., 1928, p. 143 note.
[669]Cossmann, M., Essais Pal. Comp., 2 liv., p. 53, 1896.

by them.

Since there is uncertainty what true *Hastula* is, one hesitates to differentiate a type like *houstonia* into a new subgroup because of characters which do not seem to be typical.

The specimens No. 6034, listed as "cotypes", *T. houstonia* Harris, in Cat. U. S. Nat. Mus. types[670] are not the cotypes. They are the specimens referred to in synonymy under *T. polygyra* Heilprin.

Dimensions.—Height, 19 mm.; greatest diameter, 4 mm., (immature specimen).

Holotype.—Geology Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: localities 707, 723, 725, 727, 733, 741, 743, 747 and 766; lower bed, Lisbon horizon, Claiborne Bluff, Claiborne, Ala. (Dall).

Hastula sabina, new species — Plate 72, figs. 3, 4, 6

Nucleus and apical whorls unknown; immature whorls have longitudinal ribs as in *H. venusta;* the longitudinal ribs become obsolete on the later whorls; shell attenuate; sides straight; columella straight; microscopic, radial lines, lacking as in *H. venusta.*

This species is much like *H. venusta* but differs from that species in being narrower, and with the whorls longer. In some cases the whorls in *H. sabina* are a third longer than those of *H. venusta.* Projecting the sides of the longest, broken specimen of *sabina* to form the apical angle, one finds the specimen is twice the height of a specimen of *venusta* which is equal in maturity.

Dimensions.—Height, 49± mm.; greatest diameter, 5 mm.

Holotype.—No. 3338; paratype No. 3337, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 725.

Doubtful Species

Terebra plicifera Heilprin, 1880, Proc. U. S. Nat. Mus. vol. III, p. 151, fig. 8 included in Smith. Misc. Coll., vol. XXII, p. 151, 1882, is the apical whorls of a "*Cerithium*". See under *Clava.*

[670]Schuchert, C. and others, Bull. U. S. Nat. Mus., No. 53, p. 650, 1905.

HETEROPODA

Family ATLANTIDÆ

Genus ATLANTA Lesueur, 1817.[671]

Genotype by subsequent designation Gray, 1847[672] *Atlanta Peronii* Lesueur. Living. Atlantic, Pacific and Indian Oceans.

Atlanta eocenica, new species Plate 75, figs. 4, 5, 6

Shell medium-sized; nucleus broken; first coiled dextrally; spired; last whorl large, expanded flattened; keeled, smooth; first whorls sculptured by fine but conspicuous, spiral lines crossed by fine, longitudinal lines giving a reticulate appearance; aperture ovate; area of slit broken.

In shape and keel this species is typical of *Atlanta*. It is unique in having the sculptured early whorls.

The presence of a species of *Atlanta* in the Eocene is unknown so far and there are few fossils. Woodring[673] reported none below the Miocene. Time does not permit further study of the heteropods to determine the importance of the sculptured whorls and whether the species should be separated from *Atlanta* s. s. because of that character.

Dimensions.—Diameter, 5 mm.; height, 2 mm., holotype.

Holotype.—No. 3383, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 723.

"Planaria" nitens Lea Plate 90, fig. 17

Planaria nitens Lea, 1833, p. 124, pl. 4, fig. 113; Conrad, 1865, p. 33; Conrad, 1866, p. 11; Harris, 1895, p. 30.

Non *Solarium nitens* Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., p. 47; Aldrich, 1887, Cincinnati Soc. Nat. Hist., Jour., vol. X, No. 2, p. 78 under "*Planaria nitens* Lea".

Cyclostrema (*Daronia*) *nitens* (Lea) de Gregorio, 1890, p. 138, pl. 12, fig. 64; Cossmann, 1893, p. 21 non *Cyclostrema nitens* (Philippi) Harmer, 1923.

After an examination of the holotype of *Planaria nitens* Lea one is inclined to agree with Dall that the form is a heteropod and not an embryonic whorl of an *Architectonica* as Aldrich reasonably postulated. The *Planaria nitens* is more regularly coiled than an embryonic shell. It suggests an unkeeled hetero-

[671]Lesueur, C. A., Jour. de Physique, de Chimie, d'Histoire Naturelle et des Arts, vol. 85, p. 390, 1817.

[672]Gray, J. E., 1847, p. 149.

[673]Woodring, W. P., 1928, p. 133.

pod which one finds in the Lisbon sand. The author hopes to obtain more material for comparison and diagnosis.

Dimensions.—Greatest diameter, 1.5 mm., holotype.

Holotype.—No. 5635, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Family **RINGICULIDÆ**

Genus **RINGICULA** Deshayes, 1838.[674]

Genotype by subsequent designation, Gray[675], *Auricula ringens* Lamarck. Eocene. Paris Basin.

Ringicula biplicata (Lea) Plate 73, figs. 2, 6, 9, 12; Plate 90, fig. 19

Marginella biplicata Lea, 1833, p. 201, pl. 6, fig. 216; H. C. Lea, 1848, p. 101; Harris, 1895, p. 7.

Ringicula biplicata (Lea) Conrad, 1865, p. 35; Conrad, 1866, p. 9; de Gregorio, 1890, p. 167, pl. 16, figs. 26-34, vars. *vilma, pita, leuca;* Cossmann, 1893, p. 50; Cossmann, 1895, Essais Pal. Comp., 1 liv., p. 114; Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 8, pl. 2, fig. 12.

Shell pyramidal, transversely striate, emarginate at base; substance of the shell thick; spire elevated, pointed; whorls four, rounded; columella with two large folds; mouth small; outer lip very thick and minutely crenulate within.

Length over .1, Breadth .1, of an inch.

The smaller figure is of the size of nature.

Observations.—On the superior part of the whorl the absence of a stria makes rather a broad band, above which is a single stria only. This is near the suture, and on the superior whorls it is the only one visible. With a good deal of hesitation I have placed this minute shell with the *Marginellæ.* Its elevated spire and emarginate base would seem almost to forbid its being placed with them. It has some of the generic characters of the *Pyramidella,* but the varix and crenulated inner edge would not permit its being placed in that genus. In some characters it resembles a *Cassis,* particularly in the lip and emargination, but the genus *Cassis* is without folds on the columella. On comparing the *biplicata* with M. Deshayes's figure of *Auricula ringens* (Lamarck)*, I have no hesitation in saying that the two species are very much alike, and belong to the same genus; but I cannot see the propriety of placing them with the *Auriculæ,* these being as expressly stated by Lamarck ''land shells''.† Another objection may be mentioned, that of their both having a deep emargination at the base. Lamarck says, in his generic description, ''basi integerrima''. Our species differs from the *ringens,* in having a more elevated spire, in having a band on the superior part, and in the number of folds. M. Deshayes's figure presents three distinct folds, while the description says ''biplicata''.

*Coquilles Fossiles, pl. 8, figs. 16 and 17.

†Ainsi le genre dont il est ici question ne comprend que des coquilles terrestres. An Sans Vertèbres, vol. 6, pt. 2, page 137.

[674]Deshayes, G. P., in Lamarck, 1838, tome 8, p. 342.
[675]Gray, J. E., 1847, p. 140.

Lamarck, in his description of this part, says ''subtriplicata''. The observations of Lamarck on the *ringens*, apply to the *biplicata*, ''Petite coquille fort singulière que est très-voisine par ses rapports de notre *tornatelle piétin*''. The *piétin* is now a received genus under the name of *Pedipes* (Adanson), and it occurred to me before I saw Lamarck's observations, whether it might not be placed there, to which, however, there are objections.—[Lea, 1833].

As Lea described in his *Observations* on the species, one spiral line is found on the whorls just below the suture. Below that line there is a wide, smooth band from which the striæ are absent. Below the wide band regular spiral striæ are found. On the young specimens 1.5 mm. in height, spiral striæ occur over the whole portion of the whorls. The columella on the young is not thickened as in the adult. The outer lip of the immature shell is not thickened and the plications are thinner but protrude more than in the adult forms.

De Gregorio figured and named a series of specimens of this species, as varieties. They are as Cossman stated and as may be seen from De Gregorio's figures, a group of different growth stages.

The Meyer drawing of the type of this species is included. Specimens were loaned from the Alabama Museum of Natural History through the courtesy of Dr. Walter B. Jones and Miss Winnie McGlamery. Mr. H. E. Wheeler loaned specimens from his private collection.

Dimensions.—Height, 3 mm.; greatest diameter, 2 mm.

Lectotype.—No. 6009, (broken) Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Gosport sand: Claiborne, Ala.

Ringicula trapaquara Harris Plate 73, fig. 8

Ringicula trapaquara Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 53, pl. 3, fig. 7; Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 8.

Whorls 5; whorls 1, 2 and 3 nearly or quite smooth; 4 with a well marked subsutural line and fainter ones over the whole surface; body whorl strongly striate spirally, labrum very much thickened and crenulate within, labial callosity very pronounced, the two labial plicæ strong and ascending rapidly upon the body whorl.

This species differs from *R. biplicata* Lea by its more numerous spiral striæ, its greater oral callosities, and the obliquity and strength of the columellar plicæ. *R. mississippiensis* Con. has plications somewhat similar to those of this species, but in other respects it is nearly like *R. biplicata*.

Localities.—San Antonio Ferry, Brazos River, Burleson Co.; between Orrell's and Evergreen Crossing, Elm Creek, Lee Co., Tex.

Geological horizon.—Lower Claiborne Eocene.
Type.—Texas State Museum.—[Harris, 1895].

Holotype.—Geological Department, University of Texas, Austin, Texas.

Occurrence.—Lower Claiborne: locality 725.

Ringicula trapaquara deusseni Gardner Plate 73, figs. 7, 10, 11, 13

Ringicula trapaquara deusseni Gardner, 1927, Wash. Acad. Sci., Jour. vol. 17, No. 14, p. 376, fig. 40.

Shell small, solid, rather squat; the aperture a little more than half the altitude of the entire shell. Whorls approximately five in number; those of the conch and protoconch not sharply differentiated; initial turn largely submerged, the succeeding volution becoming gradually higher and more inflated; beginning of conch probably indicated by the narrow posterior tabulation introduced near the opening of the third whorl; whorls of spire trapezoidal in outline, the body rounded. Surface sculptured with a relatively broad and deep sulcus near the posterior suture and nine or ten lineal sulci upon the body; area directly in front of the posterior sulcus smooth. Aperture oblique, constricted behind; peristome heavily callosed; outer lip slightly patulous, terminal varix wide and heavy, continuous with the parietal wash both anteriorly and posteriorly; serrate excepting along the margins of the siphonal exits. Columellar folds heavy, three in number; the posterior, posteriorly inclined, placed directly behind the abrupt constriction of the body, the medial nearly horizontal and very close to the marginal anterior plait; both the incurrent and excurrent siphonal notches rather broad and deep.
Dimensions.—Altitude, 2.5 millimeters; maximum diameter, 1.6 millimeters.
Holotype.—U. S. Nat. Mus. Cat. No. 369236.
Type locality.—4 miles southeast of Floresville, Wilson County, Texas.
Geologic horizon.—Cook Mountain formation (lower part of the Claiborne group).
The subspecies *deusseni* differs from *Ringicula trapaquara*, strict sense, in the absence of spiral sculpture over the posterior portion of the body. The sulci are often not developed, at least upon the early whorls of the spire, in *R. trapaquara* s. s. but in the subspecies this character persists to the adult stage. The subspecies has been confused with *Ringicula biplicata*, Lea, a similarly sculptured form, but more slender and decidedly less calloused about the aperture.—[Gardner, 1927].

This species is abundant in the lower Claiborne material from Lapiniere Landing, Ouachita River, La. (loc. 741). There is considerable variation in the size of the terminal varix and in the development of the serrations on the inner margin of the varix. The labium on many specimens is smooth. The serrations when present are fine.

Holotype.—United States National Museum, Cat. No. 369236.

Occurrence.—Lower Claiborne: localities 725, 727, 741, 743 and 756.

Ringicula lisbonensis Aldrich Plate 73, fig. 3

Ringicula lisbonensis Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, pp. 8, 9, pl. 2, fig. 11.

Dimensions.—Height, 2.5 mm.; greatest diameter, 1.5 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: locality 734.

Ringicula claibornensis Aldrich Plate 73, figs. 1, 4, 5

Ringicula claibornensis Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 9, pl. 2, fig. 10.

Dimensions.—Height, 3 mm.; greatest diameter, 2.5 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: locality 104.

Family SCAPHANDRIDÆ

Genus CYLICHNA Lovén, 1846[676]

(*Bullinella* Newton, 1891).

Genotype by subsequent designation, Herrmannsen,[677] *Bulla cylindracea* Pennant. Living. Europe.

Section CYLICHNOPSIS Cossmann, 1904.[678]

Type by original designation, Cossmann, *Cylichna acrotoma* Cossmann. Claibornian Eocene. United States.

Cylichna acrotoma Cassmann Plate 75, figs. 25, 26

Cylichna acrotoma Cossmann, 1893, p. 50, pl. I, fig. 40; pl II, fig. I; Cossmann, 1904, Essais Pal. Comp., 6 liv., p. 118, fig. 13 section *Cylichnopsis.*

Testa cylindrica, postice ovato-angustata, apice truncato, plano occloso ac imperforato; ultimo anfractu totam testam æquante, inferne carinato, laevigato; striis nonnullis antice parum perspicuis; apertura angusta, ad basim parum elata, ultra apicem paululum producta; columella incrassata, obtuse intorta.

ac imperfortato; ultimo anfracut totam testam æquante, inferne carinato,

Coquille â peu près cylindrique, ovalement rétricie du côté postérieur, tronquée à son sommet qui forme une surface presque plane, imperforèe et fermée au centre par la callosité du labre, ornée de stries rayonnantes et curvilignes d'accroissement. Derniér tour égal à la longueur totale, entièrement lisse, sauf en avant où s'enroulent quelques stries spirales, très serrées, à

[676]Lovén, S., 1846, p. 10. *Cylichna* is not preoccupied by *Cylichnus* Burmeister, 1844.

[677]Herrmannsen, A. N., 1852, Supplement, p. 42.

[678]Cossmann, M., Essais Pal. Comp., 6 liv., p. 118, 1904.

peine visibles; ouverture très étroite, élargie du côté antérieur, prolongée en arrière un peu au delà du sommet; bord columellaire épais et calleux, recouvrant presque entièrement la fente ombilicale, portant un pli tordu large et très obtus.

Dim.: Longoeur. 7 mill., diamètre. 3 mill.

Cette espèce se distingue par la disposition tout à fait particulière de sa surface apicale, et, comme elle n'est pas rar à Claiborne, je me demande comment il se fait que tous les auteurs l'aient confoudue avec les précédentes, sans même la figurer à titre de variété. Elle se rapproche de *C. goniophora* du bassin de Paris, mais celle ci a le sommet perforé.

Loc. Claiborne (pl. I, fig. 40 et pl. II, fig. I) ma coll.—[Cossmann, 1893].

The body whorl is shouldered posteriorly abruptly with a spiral groove. The umbilicus is nearly closed posteriorly.

Dimensions.—Height, 7 mm.; greatest diameter, 3 mm.

Holotype.—Laboratoire de Géologie de la Faculté des Sciences, Université de Paris (Sorbonne).

Occurrence.—Lower Claiborne: localities 707 and 708. Gosport sand: locality 104 (type).

Genus **CYLICHNINA** Monterosato, 1884.[679]

Genotype by subsequent designation, Cossmann, 1895,[680] *Bulla umbilicata Montagu,* 1803 non (Bolten) Roeding, 1798=*Cylichna strigella* Lovén[681]. Living. Western Europe.

The commonest species of *Cylichna*-like shell in the southern mid-Eocene is the cylindrical, perforated, nonumbilicated *galba* of Conrad. This species has been referred to as *Cylichna* or *Bulla*. *Cylichna* has an imperforated spire. *C. galba* is a typical *Cylichnina* as represented by the type species living on the shores of the British Isles. *C. kellogii* (Gabb) is another *Cylichnina* in the lower Claibornian. *C. kellogii* is less cylindrical in shape than *galba*. A few specimens of *galba* have been found which are specifically typical in other respects but have the apical opening calloused over as in *Cylichna*. This would seem to indicate that the character may not be so constant as is indicated in the generic differentiation.

Cylichnina tantilla (Anderson and Hanna)[682] occurs in the Tejon Eocene of California.

[679]di Monterosato, Marchese, 1884, p. 143.
[680]Cossmann, M., Essais Pal. Comp., 1 liv., p. 95, 1895.
[681]Iredale, T., Proc. Mal. Soc. Lond., vol. 11, p. 340, 1915.
[682]Stewart, R., 1926, p. 440.

Cylichnina galba (Conrad) Plate 75, figs. 27-30

Volvaria galba Conrad, 1833, Sept., p. 34; H. C. Lea, 1848, p. 107; Harris, 1895, p. 20.
Bulla St. Hillairii Lea, Dec., p. 98, pl. 4, fig. 78; Grateloup, 1837, p. 398 [partim]; H. C. Lea, 1848, p. 97.
Bulla galba Conrad, 1834, App. in Morton, p. 3; Conrad, 1835, p. 40, pl. 15, fig. 14; d'Orbigny, 1850, p. 374.
Cylichna galba Conrad, 1865, p. 35; Conrad, 1866, p. 9; Cossmann, 1893, p. 50; non Aldrich, 1886, Geol. Surv. Ala., Bull. 1, p. 53.
Bulla (*Cylichna*) *galba* (Conrad) de Gregorio, 1890, p. 168, pl. 17, figs. 1, 2, 5-8 not 3, 4.
Cylichna Saint-Hilairei (Lea) Cossmann, 1893, p. 49.
Bullinella Saint-Hilairei (Lea) Cossmann, 1895, Essais Pal. Comp., 1 liv., p. 95.
Bullinella galba (Conrad) Cossmann, 1895, Essais Pal. Comp., 1 liv., p. 96 section *Cylichnina*.

Shell subcylindrical, with fine, transverse, obsolete striæ: spire umbilicated at base; umbilicus replaced by an impressed line. Length ¾ of an inch.

Locality.—Claiborne, Alab.

Cab. Acad. N. S.—[Conrad, 1833].

Subcylindrical, slightly contracted near the middle; obsolete spiral lines at base; labium reflected at base; aperture very narrow above, rather suddenly expanded inferiorly.

Syn. B. ST. HILLAIRII, *Lea, Con. p.* 98, *pl.* 4, *f.* 78.

In the first edition of this No. it was inadvertently named *Volvaria galba*. It may prove to be the *Bulla constricta*, Sow.—[Conrad, 1835].

The shoulder of the body whorl is abrupt but rounded. This species is abundantly the most common *Cylichnina* in the Gosport sand. The adult individuals have fine striæ only on the anterior portion of the shell. The lines are obsolete over the remaining portion of the shell. Young specimens show fine lines over both the anterior and posterior ends of the shell. Some immature specimens show striæ over the whole exterior surface. The change in the presence of the surface striæ on the species from young to adult is seen definitely on broken, adult shells with the convoluted, younger whorls in place. The younger whorls are striated over both the anterior and posterior ends and may or may not be over the middle, depending upon the stage of development of the specimen. The older whorls may be broken away leaving the younger whorls separate and entire. These might be confused with unbroken forms of the same stage of growth and thought to differ specifically.

The species may be confused with *C. sylværupis* Harris from the Sabine Eocene. They are closely related. That species shows the transition in spiral development also. The lines seem to be finer in *C. sylvœrupis* Harris and occur posteriorly and centrally on older specimens than in *C. galba.* The Sabine species has the posterior end more oblique than *C. galba.*

Cossmann thought that the names and descriptions applied separately to this species by Conrad and Lea, represented two different species. The figures however given by Lea in 1833 and Conrad in 1835 certainly illustrate the same form.

De Gregorio included two figures in his illustrations of the species, figures 3, 4, on plate 17 which show an elevated apex in the young. No such character is found on young specimens or on young whorls of adult shells which have the later whorls broken. The figures 3 and 4 of De Gregorio would seem to belong more to the species described by De Gregorio as *Bulla* (*Utriculus*) *commixta.*

Prof. Harris[688] found a specimen of *Cylichna* in the Midway Eocene of Alabama which suggests *C. galba.*

The Conrad collection of *C. galba* consists at present of 13 specimens none of which is as large as the measurement Conrad gave in 1833.

Dimensions.—Height, 15.5 mm.; greatest diameter, 6 mm.; Height, 14 mm.; greatest diameter, 6 mm., lectotype *B. St. Hillairii* Lea.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 5486, A. N. S., *B. St. Hillairii* Lea.

Occurrence.—Lower Claiborne: localities 727, 728, 731, 734, 741 and 765. Gosport sand: locality 104 (type).

Cylichnina kellogii (Gabb) Plate 75, figs. 13, 21; Plate 90, fig. 11

Bulla Kellogii, Gabb, 1860, Acad. Nat. Sci. Phila., 2d ser., Jour., vol. IV, p. 386, pl. 67, fig. 50.
Cylichna kellogii (Gabb) Conrad, 1865, p. 35, 1866, p. 9.
Cylichna galba Heilprin, 1891, p. 401 [partim].

Subcylindrical; spire hidden; mouth linear, outer lip straight; umbilicus rudimentary, surface smooth.

Dimensions.—Length .14 in., width .07 in.

Rare, but I have seen it both from Wheelock and Caldwell Co.—[Gabb, 1860].

A *Cylichnina* which is found in the lower Claiborne, particularly abundant at Moseley's Ferry, Texas bears a general rela-

[683]Harris, G. D., Bull. Amer. Pal., vol. 1, No. 4, p. 75, pl. 7, fig. 7, 1896.

tionship to *C. galba* and superficially might be called that species. *C. galba* has the sides of the body whorl straight and parallel. The posterior end is nearly flat and the line of the posterior canal is oblique. The Moseley specimens are not so stout and the posterior end is narrower than *C. galba.* The sides of the body whorl of *C. kellogii* are convex. The posterior portion becomes constricted and the line of the posterior canal is nearly vertical.

Gabb's description of *kellogii* is not discriminating and his figure is poor. The Meyer drawing of the type is included. Prof. G. D. Harris noted differences between some lower Claibornian Texan forms and typical *galba* and he believed the specimens to be *kellogii.* *C. galba* occurs in the lower Claiborne.

Dimensions.—Height, 5.5 mm.; greatest diameter, 2.5 mm., lectotype.

Lectotype.—No. 13266, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 723, 725, 730, 743 and 766.

Cylichnina adamsi, new species Plate 75, figs. 22, 23

Shell small; perforate; posterior end truncated; sides of the shell nearly parallel; aperture narrow posteriorly; columella callus has a twist or fold which varies with specimens — on some specimens only a trace is seen — back of the twist is a groove; surface smooth except for a few microscopic spiral lines anteriorly.

This species is of the *C. galba* type of shell but differs from that species in being broader, in being smoother and in having the margin of the posterior notch or canal thicker and flared out. The columellar callus in *C. galba* spreads over the umbilical area and does not leave so much of a groove or uncovered area as in *C. adamsi.*

The specimens examined of *C. adamsi* are small, about 1 to 2 mm. in length. They are mature in character and are not like the young of known species.

The species is named in honor of Mr. John E. Adams of Midland, Texas, who collected the material.

Holotype.—No. 3388, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 727 and 730.

Genus **MNESTIA** H. and A. Adams, 1854.[684]

Genotype by subsequent designation, Cossmann, 1895,[685] *Bulla marmorata* A. Adams. Living. Philippines.

The southern American Eocene species have the protruding posterior canal as in the type of the genus. Their shape is conical, tapering posteriorly while that of the type of the genus is oval and broader.

Mnestia Dekayi (Lea) Plate 75, figs. 31-34; Plate 90, fig. 6

Bulla Dekayi Lea, 1833, p. 200, pl. 6, fig. 215; Grateloup, 1837, p. 399; H. C. Lea, 1848, p. 97; de Gregorio, 1890, p. 169, pl. 17 fig. 12.

Cylichna Dekayi (Lea) Conrad, 1865, p. 35; Conrad, 1866, p. 9, nec *Cylichna Dekayi* Meyer, 1887, Acad. Nat. Sci. Phila., Proc. vol. 39, p. 54 =*Volvulella* meyeri (Cossmann), 1893; nec *Cylichna meyeri* Aldrich, 1895.

Volvulella Dekayi (Lea) Cossmann, 1893, p. 49; Cossmann, 1895, Essais Pal. Comp., liv. 1, p. 84, pl. IV, figs. 1, 2.

Shell subfusiform, transversely striate above and below; substance of the shell thin; spire umbilicate; whorls compressed above; columella twisted and reflected at the base; mouth linear, curved, extending above the spire; outer lip sharp.

Length 7-20th, Breadth 3-20th, of an inch.

Observations.—This species might at first view be taken for the *St. Hillairii*, but may, on examination, be readily distinguished by its conical top. I have found it much rarer in this deposit, having been able to obtain but three specimens, while the other exists in great numbers. It is not cylindrical, like that species, but rather disposed to be conical above. They also differ in the base.—[Lea, 1833].

A fine series of specimens of the species from the young to adult occurs in the collection from Orangeburg, S. C. The young have the posterior end pointed with a slight trace of the umbilicus.

A related form of this species occurs in the Jackson Eocene. It was figured as a variety of *dekayi* by Meyer but separated as a distinct species, *meyeri* by Cossmann. The Jackson species has the typical, protruding posterior end but *dekayi* is more slender and the anterior end less enlarged than the Jackson species. The revolving striæ are closer together on *M. dekayi* although both species have the lines confined to the two ends.

There are 2 specimens of Lea's type material. One (No. 6008, A. N. S.) is worn but it shows striations on both ends as illustrated by Lea.

Dimensions.—Height, 4 mm.; greatest diameter, 2 mm.

[684] Adams, H. and A., 1854, vol. II, p. 10.
[685] Cossmann, M., Essais Pal. Comp., 1 liv., p. 99, 1895.

Types.—No. 6007 (fragment) and No. 6008, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: localities 136, 707, 708, 723, 725 and 741. Gosport sand: locality 104 (type).

Genus LITHOPHYSEMA Stewart, 1926.[686]

Genotype by original designation, *Haminea grandis* Aldrich. Eocene. Southern United States.

Lithophysema grandis (Aldrich) Plate 76, figs. 6-9

Haminea grandis Aldrich, 1886, Geol. Sur. Ala., Bull. No. 1, p. 35, pl. 3, fig. 1.

Bulla (*Haminea*) *grandis* (Aldrich) de Gregorio, 1890, p. 169, pl. 17, fig. 10.

Scaphander grandis (Aldrich) Dall, 1890, p. 17, pl. 10, fig. 9, section *Bucconia;* Cossmann, 1895, Essais Pal. Comp., 1 liv., p. 88.

Lithophysema grandis (Aldrich) Stewart, 1926, Acad. Nat. Sci. Phila., Proc. vol. 78, p. 438.

Shell large, very thin, broadly ovate, summit rounded, with a deep pit marking the position of the spire. Surface covered with narrow, transverse striæ, with rounded spaces between; spaces below the center again subdivided by more shallow lines, closer set as the base is approached, but nearly obsolete at apex; lower extremity obliquely but broadly rounded; aperture rather large, nearly equal in width as far as shown. Inner lip represented by an exceedingly thin lamina, reflected, showing in the type a narrow, oblique, umbilicus.

Locality.—Bunker Hill, La.; Jackson Group.

This species is the largest yet described from the Southern Tertiary. The specimen is partly a cast; substance of shell is thinner than ordinary writing-paper. The lines of growth and transverse striæ are well shown on cast.—[Aldrich, 1886].

This species attains a large size. The shell is fragile so that although the form is fairly abundant in the Jackson Eocene, perfect specimens are rare. The apical area is usually crushed or the spire eroded. The spire is narrowly and deeply sunken. The one specimen in the Harris collection which has the apical area intact shows that the spire is not perforated. The specimen is a large shell. From the character of that specimen and from the incomplete knowledge of the species, the author is not willing to agree with Stewart that the genus of which this species is the type has a perforate spire. The species does differ from *Scaphander* under which Dall placed it, in being more completely coiled and having the sunken apex. It is like *Haminea*[687] in shape but that genus lacks the sunken spire.

[686]Stewart, R. B., 1926, p. 438.

[687]Iredale, T., Proc. Mal. Soc. Lond., vol. 11, p. 172, 1914.

On large specimens where the columella and callus have not been broken or partially worn, the callus covers the umbilical area. The lower margin of the callus may be restricted with a slight groove at the back.

This species has always been regarded as a "leit-fossil" of the Jackson Eocene. In Bull. Amer. Pal., vol. VIII, No. 33, Harris described three species of mollusks and called attention to other known species including *Haminea grandis* Aldrich from the same locality near Marion in Angelina County, Texas (loc. 761). Attention was called to the fact that there was a mixture of lower Claiborne and Jackson species. In 1928, Charles L. Baker sent a specimen of *Haminea grandis* Aldrich from the lower Claiborne "near the top of the south side of the Angelina River bank at Marion Ferry, on the north line of Angelina County, Texas," apparently the same horizon as the Harris material. Harris and Baker specimens are similar internal molds of reddish orange sandstone.

One of the lower Claiborne specimens is figured herein, together with a typical shell from the Jackson for comparison.

Dimensions.—Height, 45 mm.; greatest diameter, 34 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: localities 745 and 761. Jackson Eocene: (type).

Genus **ABDEROSPIRA** Dall, 1895.[688]

(*Roxania* Leach MS., 1819 fide Gray, 1847)

Genotype by original designation *A. chipolana* Dall. Chipola Miocene. Florida and Gatun.

Abderospira Aldrichi (Langdon) Plate 75, figs. 10, 11

Non *Bulla biumbilicata* Meyer, 1884 as stated by Aldrich, 1886=*A. meyeri*, new name.

Bulla (*Haminea*) *Aldrichi Langdon*, 1886, Amer. Jour. Sci., 3d ser. vol. XXXI, No. 183, pp. 208, 209; de Gregorio, 1890, p. 169; non Cossmann, 1893, p. 50 under *Atys oviformis* (Meyer).

Haminea Aldrichi (Langdon) Aldrich, 1886, Bull. Geol. Sur. Ala., vol. 1, p. 36 [partim].

Bulla aldrichi Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. vol. IX,

[688]Dall, W. H., U. S. Nat. Mus., Proc. vol. 18, p. 32, 1895.

No. 2, pp. 49, 50 [partim].

Non *Cylichna aldrichi* Aldrich, 1897, Bull. Amer. Pal., Vol. II, No. 8, p. 7, pl. 4, fig. 5; Harris, 1899, Bull. Amer. Pal. vol. III, No. 11, pl. 1, fig. 13=*A. sabina,* new name.

Abderospira aldrichi (Langdon) Stewart, 1926, Acad. Nat. Sci. Phila., Proc. vol. 78, p. 439.

Shell elongate, oval, substance rather thin, punctate-striate, striæ about 20, transverse; spire involute; labrum sharp and slightly dentate; mouth longitudinal and rather larger at base than at top; columella very slightly thickened at the base.

Height ——— .2, Breadth ——— .1.

Resembles *B. glaphyra* Desh., but differs in the striæ which are in *B. Aldrichi* from the top to the bottom, while in *B. glaphyra* Desh. they are confined to the upper and lower thirds of the shell.

These two species will be figured in the forthcoming Report of the Geological Survey of Alabama.—[Langdon, 1886].

Much of the confusion with regard to this species has been from the idea that Langdon did not give a locality for his species and the fact that Aldrich illustrated the species with a Sabine (Wilcox) specimen, which is a distinct species.

Langdon on p. 208, preceding the description of the species definitely lists the species from "Ferruginous sand layer" containing typical Gosport sand species on Ferry road, half a mile above the Upper Landing at Claiborne, Ala. This definitely places the type locality for *A. aldrichi* (Langdon) in the Claibornian fauna.

The above statements were made before an examination of the type specimens of the three species involved was made. An old label with the type of *Bulla aldrichi* Langdon states "upper bed overlying clays, Claiborne."

Aldrich, in 1886 placed Langdon's species in synonymy with the preoccupied *Bulla biumbilicata* Meyer which was from Claiborne, Ala.

A study of the types of *Bulla aldrichi* Langdon, *Bulla biumbilicata* Meyer and *Cylichna aldrichi* Aldrich non Langdon which are all in the Aldrich collection, Johns Hopkins University, reveals that each represents a distinct species.

A. aldrichi (Langdon) differs from *A. biumbilicata* (Meyer) =*meyeri* new name, in being larger, ribs wider apart and the callus smaller. The specimen figured herein from loc. 726 is typical *B. aldrichi* Langdon and that of Aldrich is brought out under *A. sabina,* new species.

Dimensions.—Height, 4.5 mm.; greatest diameter, 3 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: locality 726. Gosport sand: Claiborne, Ala. (type).

Abderospira meyeri, new name Plate 75, fig. 9

Bulla biumbilicata, Meyer, 1884, Acad. Nat. Sci. Phila., Proc. vol. 36, p. 110, text fig. non *B. biumbilicata* Deshayes, 1864.

Shell small, moderately thick, oval, the upper end obliquely truncated and umbilicated, the lower end somewhat tapering. Last whorl most prominent at about one third of the whole length. Outer lip? Inner lip below with a large trigonal thin callus, which covers a minute umbilicus. Surface with revolving lines, disappearing at both ends and generally most distant from each other at about the middle of the shell. A strong magnifying glass shows that these lines are furrows, looking like pearl-ribbons, which structure causes the surface to look at some places as if it were minutely longitudinally costated.

Length, 2 1/3 m.

Locality.—Eocene sand from Claiborne, Ala.

Remarks.—One specimen, the outer lip of which is not quite perfect.—[Meyer, 1884].

Dimensions.—Height, 2.5 mm.; greatest diameter, 1.5 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Abderospira sabina, new species Plate 75, fig. 12

Cylichna aldrichi Aldrich, 1897, Bull. Amer. Pal., vol. II, No. 8, p. 7, pl. 4, fig. 5; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, pl. 1, fig. 13 non *Bulla Aldrichi* Langdon, 1886.

Shell small; involute; labrum nearly straight; anterior aperture broad, posterior narrow; surface entirely covered with spiral, punctate ribs.

This species is larger than *A. Aldrichi* (Langdon) and the posterior end is more contracted. The spiral, punctate ribs are irregular in size. The punctations are not so strong as on *A. Aldrichi* (Langdon).

In *sabina* there is a division of the primary ribs anteriorly and posteriorly, with faint, intervening ribs present. The spiral ribs on the back of the shell are broken up into finer, irregular striæ.

Dimensions.—Height, 5.5 mm.; greatest diameter, 3 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Sabine Eocene: Choctaw Corner, Ala.

Abderospira stewarti, new species Plate 75, figs. 7, 8

Shell small, contracted anteriorly; involute; slightly umbilicate; shell smooth, except for microscopic, spiral lines on the base.

The species differs from the other species of Claiborne and Sabine Abderospiras in lacking the spiral lines over the whole surface of the shell. The shape is narrower and more contracted anteriorly.

Named in honor of Dr. Ralph B. Stewart of the United States Geological Survey, Washington, D. C.

Dimensions.—Height, 3 mm.; greatest diameter 1.5 mm., holotype.

Holotype.—No. 3384, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 741.

Genus **AKERA** Müller, 1776.[689]

Genotype by monotypy *A. bullata* Müller. Living. Northern and western Europe. Mediterranean.

Akera texana Aldrich Plate 75, fig. 18

Akera texana Aldrich, 1911, Bull. Amer. Pal., vol. V, No. 22, p. 5, pl. II, fig. 1.

Dimensions.—Height, 18 mm.; greatest diameter, 10 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Lower Claiborne: Smithville, Texas.

Genus **ATYS** Montfort, 1810.[690]

Genotype by original designation, *Atys cymbulus* Montfort (=*Bulla nancum* Linné). Living. Indo-Pacific.

"Atys" salina Dall Plate 75, figs. 14-17

Atys (*Acrostemma*) *salina* Dall, 1895, Proc. U. S. Nat. Mus. vol. 18, p. 29.

Shell small, rather slender, involved, with a polished surface and the aperture produced in a point behind the spire; body of the shell wider anteriorly; sculpture of fine incised lines, closer and more numerous anteriorly, becoming sparse about the middle of the shell, and nearly absent toward the spire, except at the extreme end; surface otherwise smooth, ex-

[689]Muller, O. F., 1776, p. 242.
[690]Montfort, D., 1810, p. 343.

cept at the posterior end, where close-set, straight, sharp, rather deep axially directed grooves extend from the apex forward about one-fifth the length of the shell; aperture narrowest in the middle; outer lip axially straight, incrementally somewhat arched, behind produced beyond the spire to a rather narrow point, whence it returns with a twist on the body, covering the apical region with a rather thick mass of callus, which is much thinned anteriorly; pillar thin, solid, arched, with a narrow, long chink behind it; aperture rounded in front; outer lip thin, sharp-edged, simple. Longitude of shell, 4.5 mm; maximum diameter, 1.5 mm.

Habitat.—Lower Eocene, Lisbon horizon, at the head of Saline Bayou, St. Maurice. Winn Parish, Louisiana, collected by Johnson (station 2005).

Type.—No. 106971, U. S. N. M.; received from U. S. Geological Survey.

This species is remarkable for the combination of characters ordinarily regarded as subgeneric or sectional. It has the form of *Bullinella*, but the posterior extension of the aperture is narrowed to a rounded point, the spire is concealed, not marked by any pit or perforation, but covered by a short, thick mass of callus; finally, the shell is very narrowly umbilicate, with a slender, arched, un[i]plicate pillar, twisted, but without the short, strong twist of typical *Atys*. When fully developed the fringe-like grooved area at the apical end is strongly marked character.—[Dall, 1895].

This species is unique. It does not belong to *Acrostemma* Cossmann, 1889[691], which has a "funnel-shaped" spire. *A. salina* has the apical end with a thick callus. This species as well as the two others included are not typical *Atys*.

Through the courtesy of Dr. Paul Bartsch the illustrations of the holotype of this species are included.

Occurrence.—Lower Claiborne: head of Saline Bayou, St. Maurice, Winn Parish, La. (Dall).

"Atys" atysopsis (Harris) Plate 75, fig. 24; Plate 90, fig. 20

Cylichnella atysopsis Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 54, pl. 3, fig. 9, a.

"*Volvula minutissima*" Gabb, specimen in coll. Acad. Nat. Sci. Phila., fide Harris, 1895 non *V. minutissima* Gabb, 1860.

General form globose as figured; substance of the shell rather thick; spirally striate; columella with one fold; umbilicated.

Locality.—Little Brazos River, near iron bridge, on Moseley's Ferry road.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum. Fig 9a is the so-labelled *V. minutissima* of the Academy collection.—[Harris, 1895].

Specimens of this species have not been identified in this report. From the figures and description the author is not sure as to all the details of character. *Cylichnella* implies that the spire is imperforate which would also include *Atys*. The exact generic determination is left for further research. The writer agrees

[691]Cossmann, M., Ann. Soc. Roy. Mal. de Belgique, t. 24, ser. IIV, t. 4, p. 314, 1889. Genotype by original designation, *Bulla coronata* Lam. Eocene. Paris Basin.

with Prof. Harris in his suggestive specific name. If the posterior end were more produced one would place the species readily in that genus.

Abderospira aldrichi (Aldrich) might be confused with the species because of a similarity of shape and of the coarse, spiral sculpture completely covering the surface.

A. aldrichi differs in having the spiral striations punctate, in being perforate and lacking the umbillcal plication. It is twice the size of the type of this species.

Holotype.—Formerly in the Geology Department, University of Texas, Austin, Texas. Probably lost. No. 13267, A. N. S. labelled "*Volvula minutissima* Gabb" not of Gabb.

"Atys" claibornensis (Aldrich) Plate 75, fig. 20

Retusa claibornensis Aldrich, 1911, Bull. Amer. Pal., vol. V, No. 22, p. 9, pl. II, fig. 7.

Holotype.—Not found.[692]

Occurrence.—Gosport sand: Claiborne, Ala. (Aldrich).

Family ACTEOCINIDÆ

Genus ACTEOCINA Gray, 1847.[693]

Genotype by monotypy *Acteon Wetherilli* Lea. Miocene. New Jersey.

Acteocina commixta (de Gregorio) Plate 75, figs. 1, 2, 3

Bulla (*Utriculus*) *commixta* de Gregorio, 1890, p. 168, pl. 17, figs. 13-14. *Testa subcylindrica, antice spiraliter striata; apertura antice paulo dilatata; labro columellari contorto plicatoque; spira exerta, minima, subgradata, circiter* 1/10 *totius longitudinis. L.* 3 *mm.*

Je crois qu'on a confondu cette espèce avec les jeunes exemplaires de la *Bulla* (*Cylichna*) *galba*, dont j'ai donné plusieurs figures d'exemplaires d'âge différent, de sorte qu'on puisse les comparer. La forme de la spire, le contour et surtout le pli columellaire sont des caractères differentiels suffisants par reconnaitre cette espèce. On peut comparer la fig. 2 de notre planche 17 qui représente un examplaire de la *galba* du même âge pour en voir les diffèrences. Elle diffère de la *Tornatina Wetherelli* Lea par la spire beaucoup plus court etc.—(Coll. mon Cabinet).—[De Gregorio, 1890].

One is not sure whether the *A. leai* (Aldrich)[694] from the Sabine Eocene is the same as this species. *A. leai* has a definite

[692]Search was made at the Geology Department, Johns Hopkins University, Baltimore, Md. and at the Alabama Museum of Natural History, University, Ala.

[693]Gray, J. E., 1847, p. 160.

[694]Aldrich, T. H., Bull. Amer. Pal., vol. I, No. 2, p. 7, pl. 2, fig. 6, 1895.

band of spiral lines on the posterior area of the body whorl. Such a band is not illustrated or described as being on De Gregorio's species.

A drawing of specimen of ? *A. commixta* de Gregorio, U. S. Nat. Mus. No. 2391, by G. D. Harris is included. The specimen is from Claiborne. It is dissimilar to De Gregorio's figure in shape but De Gregorio's may not be a true representation.

Holotype.—De Gregorio home Via Molo, 132, Palermo, Sicily.

Occurrence.—Gosport sand: locality 104.

Acteocina leai (Aldrich) Plate 75, fig. 19

Bullina leai Aldrich, 1895, Bull. Amer. Pal., vol. I, No. 2, p. 7, pl. 2, fig. 6.

Tornatina leai (Aldrich) Cossmann, 1895, Rev. Bibliog. pour l'annee, 1895, p. 34; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 7, pl. 1, fig. 8.

This species is characteristic of the Sabine (Wilcox) Eocene. Aldrich mentioned in his original description that he had a young specimen from the Gosport sand at Claiborne which was probably the same as the Sabine form. Harris drew the included figure of a specimen from Claiborne, Ala., No. 2791, United States National Museum collections. He identified it as the *A. commixta* de Gregorio. But if De Gregorio's figure is correct, this Claiborne specimen is more like *A. leai* (Aldrich). This also confirms Aldrich's statement of finding a specimen in the Claibornian. Possibly with more specimens to study, *commixta* and *leai* may prove to be the same.

The presence of this species of *Acteocina* as well as *commixta* de Gregorio in the Eocene lowers the stratigraphic range of the genus as given by recent authors. Woodring[695] states that the earliest American species are from the upper Oligocene, Byram marl. Such a range has been repeated by Grant and Gale.[696]

Gardner[697] doubtfully identified a specimen as this species from the Midway of Texas.

Genus VOLVULELLA Newton, 1891.

(*Volvula* Adams, 1850.)

Genotype by subsequent designation, Bucquoy, Dautzenberg

[695]Woodring, W. P., 1928, p. 119.

[696]Grant, U. S. IV, and Gale, H. R., 1931, p. 446.

[697]Gardner, Julia, Univ. Texas, Bull. No. 3103, p. 205, 1935.

and Dollfus, 1886,[698] *Volvula rostrata* Adams. Living. Australia.

Newton[699] thought that *Volvula* of Adams was too near in spelling to *Volvulus* Oken, 1815. Cossmann followed Newton in the use of *Volvulella,* a name which Newton proposed to substitute for *Volvula.* According to the recommendation to Art. 36, International Rules of Nomenclature the endings of *Volvula* and *Volvulus* since they have been proposed, are distinct and the two names may stand. However Grant and Gale[700] discovered the *Volvula* of Gistel, 1848, in *Diptera* which preoccupies the name *Volvula,* of Adams. The substitute name, *Volvulella* of Newton therefore comes into usage.

Volvulella subradius (Meyer) Plate 74; fig. 7

Cylichna confr. radius Meyer, 1885, Amer. Jour. Sci., 3d ser., vol. XXIX, p. 468; non *C. radius* Deshayes.
Cylichna subradius Meyer, 1886, Bull. Geol. Sur. Ala., No. 1, p. 77, pl. 1, fig. 17 subgenus *Volvula.*
Bulla (*Volvula*) *subradius* de Gregorio, 1890, p. 169, pl. 17, fig. 9.
Volvulella subradius Cossmann, 1893, p. 49.

Small, rounded cylindrical, spire produced, acute; inferior part, except the base, with impressed, revolving lines, base with a minute, umbilicate fissure; aperture but little widening.

Locality.—Claiborne, Ala.

Belongs to the subgenus *Volvula.* In its slender and not inflated form and its acute top, it differs essentially from *Cylichna Dekayi,* Lea, sp., from the same locality. A similar species, however, seems to be *Bulla cylindrus.* H. C. Lea,* from the Miocene. It scarcely differs from *Bulla radius* Desh.,†of the Paris basin. A specimen from Wheelock, Texas, determined as *Volvula Conradiana,* Gabb,‡ is less slender, but else very similar. An examination of a large amount of material may lead to a unison of *Cylichna subradius* with one or all of the last-named species.—[Meyer, 1886].

**Trans. Am. Philos.* Soc., 1843, IX., Second Series, p. 250, pl. 35, fig. 43.
†Desh., An. s. vertèb., II., p. 226, pl. 39, figs. 22, 23.
‡*Jour. Ac. Nat. Sci.,* Philadelphia, IV., Second Series, 1860, p. 386, pl. 67, fig. 51.

Dimensions.—Height, 2.5 mm.; greatest diameter, 1 mm., holotype.

Holotype.—Geology Department, Johns Hopkins University, Baltimore, Md.

Occurrence.—Gosport sand: locality 104.

Volvulella volutata (Meyer and Aldrich) Plate 74, figs. 13, 14

Cylichna volutata Meyer and Aldrich, 1886, Cincinati Soc. Nat. Hist.,

[698]Bucquoy, E., Dautzenberg, Ph. and Dollfus, G. F., 1886, p. 533.
[699]Newton, R. B., 1891, p. 268.
[700]Grant, U. S., IV and Gale, H. R., 1931, p. 450.

Jour., vol. IX, No. 2, p. 44, pl. II, fig. 4.
Volvulella volutata (Meyer and Aldrich) Cossmann, 1893, p. 49.
Cylindrical, top regularly conical. Aperture straight, widening anteriorly. Columella anteriorly with a nearly vertical fold.
Newton.
Indistinct revolving impressed lines are only visible under a strong glass. The conical top is distinctly defined from the cylindrical body.—[Meyer and Aldrich, 1886].

This species differs from *V. subradius* Meyer in being less convex in shape. In *volutata* the line of the mid-region of the outer lip is straight. The aperture is narrow and enlarged anteriorly. The anterior and posterior ends are about equal in the degree of constriction. Under the lens microscopic revolving lines are visible on the anterior end. The remaining portion of the shell is smooth. On the middle region of worn specimens there may be obscure revolving lines. The species differs from *V. conradiana* Gabb, as depicted by Gabb, in being less slender.

Dimensions.—Height, 5 mm.; greatest diameter, 2 mm.

Holotype.—Formerly at Geology Department, Johns Hopkins University, Baltimore, Md. Not found 1936.

Occurrence.—Lower Claiborne: localities 723, 726, 728, 729, 731, 734 and 770.

Volvulella minutissima (Gabb) Plate 74, figs. 9-12

Volvula minutissima Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d ser., vol. IV, p. 386, pl. 67, fig. 52; Conrad, 1865 p. 35; Conrad, 1866, p. 9,, non specimen A. N. S. Phila. labelled "*Volvula minutissima*" Gabb type.

Subglobose; mouth arcuate subtruncate anteriorly; substance of shell moderately thick; surface minutely granular; a distinct fold is formed by the inner lip anteriorly and bounds the mouth in that direction.
Dimensions.—Length .09 in., width .05 in.
Locality.—More common than the preceding, from Caldwell Co. My Collection.—[Gabb, 1860].

Harris examined the specimen labelled type of "*Volvula minutissima*" Gabb in the Academy of Natural Sciences in Philadelphia and did not believe the specimen so labelled to be the type of Gabb's species. Harris, in 1895, p. 54, renamed the specimen *Cylichnella atysopsis*. For further discussion see under that species.

Specimens from loc. 741 resemble Gabb's figure which is poor and may be misleading.

Holotype.—Lost.

Occurrence.—Lower Claiborne: locality 741.

Volvulella Conradiana (Gabb) Plate 74, figs. 15-18

Volvula Conradiana Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2d ser., vol. IV, p. 386, pl. 67, fig. 51; Conrad, 1865, p. 35; Conrad, 1866, p. 9.

Subcylindrical narrow; apex of body whorl about as high as the width of the lower part of the mouth; mouth linear, extending the whole length of the shell and slightly wider anteriorly than elsewhere, outer lip nearly straight; inner lip slightly thickened at the anterior extremity; surface marked by microscopic impressed revolving lines.

Dimensions.—Length .17 in., width .06 in.

Locality.—Rare from both localities.—[Gabb, 1860].

This is the slenderest of the Volvulellas so far described from the Clabornian. The revolving striations are well developed over the anterior portion of the shell. Some specimens are smooth over the remaining portion of the shell. Other specimens show faint lines, just distinguishable with the microscope, over the whole surface of the shell.

Dimensions.—Height, 5 mm., greatest diameter, 1.5 mm.

Holotype.—Not found.

Occurrence.—Lower Claiborne: Caldwell and Wheelock Counties, Texas (Gabb) ; localities, 136, 723, 727, 734 and 741.

Volvulella smithvillensis (Harris) Plate 74, fig. 8

Volvula ? smithvillensis Harris, 1895, Acad. Nat. Sci. Phila., Proc. vol. 47, p. 54, pl. 3, fig. 8.

Shell large anteriorly and centrally but attenuated posteriorly; thick; spirally striate near either terminus; columella with one strong fold.

This shell has somewhat the form of *Actaeonella*. It differs from *V. minutissima* by its greater thickness, its greatest diameter being located more to the anterior, and by its thick, strong collumellar fold.

Locality.—Smithville, Bastrop Co., Tex.

Geological horizon.—Lower Claiborne Eocene.

Type.—Texas State Museum.—[Harris, 1895].

Holotype.—Formerly at the Geology Department, University of Texas, Austin, Texas. Probably lost.

Volvulella wellsi, new species Plate 74, figs. 5, 6

Shell small; elongate; shape broader posteriorly; aperture enlarged anteriorly; posterior end drawn out into a spire; callus extends on the inner margin of aperture the full length of shell, extending full length of spine; posterior callus grooved forming a shallow channel; anterior callus with fold; surface ornamented with microscopic, spiral lines which are wider apart and more conspicuous over the anterior and posterior ends and obscure over the middle.

This species differs from *V. volutata* (Meyer and Aldrich) in being enlarged more posteriorly. The spiral striations cover more of the shell in *V. wellsi.* The posterior spine is longer than that in *V. volutata.* The species differs from *V. conradiana* (Gabb) in being more globose posteriorly.

Named in honor of Dr. John W. Wells.

Holotype.—No. 3360, paratype No. 3361, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 741.

Volvulella loisæ, new species Plate 74, figs. 3, 4

Shell small; subglobose; aperture arcuate broader anteriorly; posterior end extended into a tapering spine; slight anterior fold; callus covers the length of the inner margin of the aperture, enlarging posteriorly; callus grooved posteriorly forming a shallow channel; slight umbilical groove; surface ornamented with microscopic spiral lines anteriorly; these do not show on the illustration but are conspicuous with the lens.

This species differs from *V. subradius* (Meyer) to which it bears the greatest similarity in tapering further posteriorly and being narrower anteriorly.

Named in honor of Miss Lois M. Schoonover, Department of Geology, Bryn Mawr College, Bryn Mawr, Pa.

Holotype.—No. 3367 Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 723 (type) and 725.

"Tornatina" angelinæ (Harris)

Tornatina angelinæ Harris, 1919, Bull. Amer. Pal., vol. VIII, No. 33, p. 17, pl. 2, fig. 14.

This large specimen, 23 mm., height, of the Acteocinidæ occurs with an associated Jackson and Claiborne fauna near Marion, Angelina County, Texas.

Iredale[701] believed that *Tornatina* A. Adams, 1850, is congeneric with *Retusa* Brown, 1827.

The Texas specimen is too imperfect for definite generic determination.

[701]Iredale, T., Proc. Mal. Soc. Lond., vol. XI, p. 300, 1915.

Holotype.—No. 1413, Paleontological Research Institution.

Occurrence.—Claibornian: along the Angelina River, Angelina County, 2 miles above Marion, Texas.

Family ACTEONIDÆ

Genus ACTEON, Montfort, 1810.[702]

(*Tornatella* Lamarck, 1822).

Genotype by original designation *Voluta tornatilis* Gmelin. Living. Europe.

Acteon pomilius Conrad Plate 74, figs. 27, 28, 34; Plate 90, figs. 9, 14

Acteon pomilius Conrad, 1833, Nov., p. 45, H. C. Lea, 1848, p. 95; Harris, 1895, p. 36.
Actæon pomilus Conrad, 1834, App. in Morton, p. 4; Conrad, 1865, p. 34; Conrad, 1866, p. 9.
Monoptygma elegans Lea, 1833, p. 203, pl. 6, fig. 217; Harris, 1895, p. 18.
Acteon pomilius d'Orbigny, 1850, p. 343.
Tornatella (*Actæon*) *pomilia* (Conrad) Heilprin, 1879, Acad. Nat. Sci. phila., Proc. vol. 31, p. 222.
Acteon ? elegans (Lea) de Gregorio, 1890, p. 166, pl. 16, fig. 23.
Actæon elegans (Lea) Cossmann, 1893, p. 48.
Actæon annectens Cossmann, 1893, p. 48 [partim], pl. 1, fig. 37; non *A. annectens* Meyer, 1886.

Narrow, with revolving narrow sulci which are transversely striated; fold on the columella much elevated and distant from the base; labrum thick, with a sharp waved edge.—[Conrad, 1833].

The variation of the species *pomilius* presents striking extremes. For this reason, several names have been applied to the different stages in the change of the species. They have been included usually in the synonymy of *pomilius* Conrad or *punctatus* Lea whichever author was believed to have priority.

Conrad first applied the name *pomilius* to the species although he never figured the shell. In his catalogue in the Appendix to Morton's "Synopsis of the Cretaceous Organic Remains," he makes the *punctatus* of Lea synonymous with *pomilius* so that one knows what kind of *Acteon* he had in mind. In 1865 and 1866, he must have recognized a difference in shape between the two forms because he kept the two species distinct.

The Meyer drawing of the lectotype of *pomilius* is included herein. The type is not elevated so much as are specimens in

[702]Montfort, D., 1810, p. 315.

the Harris collection. The Harris specimens represent extreme in height. Lea's *Monoptygma elegans* is synonymous with this phase of the variation. Conrad's description states that the shell is "narrow" which would separate it from the type of Lea's *punctatus*. The type of *punctatus* is a short-spired specimen with an ovate body whorl. This appears to be what Meyer distinguished as *A. inflatior*.

The nucleus consists of one and a half smooth whorls.

The nuclei of *punctatus* and *pomilius* are alike in whorl number but the first nuclear whorl of *pomilius* is slightly more acute. The shell is composed of three or four whorls. The number varies in both forms. The whorls of the spire of *pomilius* are elevated or attenuated while in *punctatus* the spire is short giving the shell a blunt appearance. The shape of both forms varies. There are from six to nine, revolving, punctate ribs on the whorls of the spire of *pomilius* while there are consistently four or four to six revolving ribs on the spire whorls of *punctatus*. The difference in the number of spiral ribs justifies a separation of the two forms. Shells from the lower Claibornian at Moseley's Ferry, Texas show typical *punctatus* characters. The revolving ribs on *pomilius* tend to be finer. On *punctatus* they are irregular in size. Some of the ribs on *punctatus* are twice the width or more of those on *pomilius*. The ribs of *punctatus* are irregular in size. There is a tendency on that species for the wide ribs to split. Many specimens have an almost complete series of wide ribs, while some show where the rib begins as a wide rib and divides, continuing as two, finer ribs. On other specimens the division of the ribs does not take place.

The above description of the two forms is of the species as it is found at the type locality, in the Gosport sand at Claiborne, Ala. Examining the stock in the Sabine Eocene, one finds that the initial development of the species is that of a slender shell, with elevated spire but with four or five, revolving ribs on the whorls of the spire. Such a form is the combination of the characters possessed by the species as it appears in the mid-Eocene at Claiborne, Ala. Aldrich[703] named the Sabine form *A. pomilius mult-*

[703]Aldrich, T. H., Nautilus, vol. XXII, No. 8, p. 76, 1908.

annulatus.

There is probably a close relationship between the stock of *pomilius-punctatus* and *A. idoneus* Conrad. But because *A. idoneus* retains the irregular, smooth areas on the upper portion of the body whorl and parts of the other whorls on individuals in the lower Eocene as well as on the Claibornian specimens, it is classified as a distinct species.

Cossmann found an *Acteon* in the Gosport sand which he placed under *A. annectens* Meyer[704] from the Jackson Eocene. *A. annectens* is like *punctatus* in having the fewer number of revolving striæ on the body whorl. Meyer differentiated *annectens* from *punctatus* in having narrower ribs with wider interspaces.

The number of revolving ribs on the body whorl varies on *A. punctatus.* Lea's type shell had as many as twenty-eight revolving ribs on the body whorl. Specimens from lower Claiborne localities have as few as eighteen. The number of revolving ribs on the whorls of the spire is consistently four. Therefore the number of revolving ribs on the body whorl is not a differentiating character. *A. annectens* and *A. punctatus* differ in the number of revolving ribs on the first whorl of the spire. *A. annectens* differs in having five or six revolving ribs on the first post-nuclear whorls. They are half the size of the succeeding ribs. In *A. punctatus* the revolving ribs are consistent in size and number on the whorls of the spire. Typically the fold is larger and more deeply grooved in *A. annectens.* Some specimens of *A. punctatus* have the fold increased in size. A figure of *A. annectens* is included, plate 74, fig. 30.

According to Cossmann's figure of his Claiborne shell he had a specimen with about six, revolving ribs on the penultimate whorl, with a more elongate shape. Such is of the *pomilius* type. The form of Cossmann's shell is approaching *punctatus.*

The Conrad collection consists of 6 specimens which exhibit the variation as discussed herein.

Dimensions.—Height, 10 mm.; greatest diameter, 6 mm., lectotype. Greatest diameter, 3.5 mm. lectotype *M. elegans* Lea.

[704]Meyer, O., Amer. Jour. Sci., 3d ser., vol. XXIX, pp. 466, 468, 1885; Meyer, O., Geol. Sur. Ala., Bull. No. 1, pt. II, p. 77, pl. 2, fig. 30, 1886.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.; No. 6011, A. N. S., lectotype *M. elegans* Lea.

Occurrence.—Lower Claiborne: localities 136, 707, and 731. Gosport sand: locality 104 (type).

Acteon pomilius punctatus Lea

Plate 74, figs. 25, 29, 31, 35, 36; Plate 90, fig. 2

Acteon punctatus Lea, 1833, Dec., p. 111, pl. 4, fig. 96; H. C. Lea, 1848, p. 95; de Gregorio, 1890, p. 165, pl. 16, figs. 21, 22; Harris, 1895, p. 37; nec *Tornatella punctata* Férussac, 1823, nec d'Orbigny, 1842 fide Dall, 1892.

Actæon inflatior Meyer, 1886, Geol. Sur. Ala., Bull. No. I, pt. II, p. 78, pl. 2, fig. 31; Cossmann, 1893, p. 48.

Actæon punctatus Conrad, 1865, p. 34; Conrad, 1866, p. 9; Meyer, 1885, Amer. Jour. Sci., vol. 29, p. 468; Dall, 1892, p. 14 [partim]; Cossmann, 1893, p. 48; Cossmann, 1895, Essais Pal. Comp., 1 liv., p. 46.

Actaeonidea punctatus (Lea) Cossmann, 1895, l. c., p. 52, section *Rictaxis*.

Shell ovately conical, transversely and closely furrowed; furrows closely set with punctures; substance of the shell rather thick; spire rather elevated, pointed; suture somewhat impressed; columella with one fold; whorls five; mouth narrow, about three fifths the length of the shell; outer lip thickened about the middle.

Length 7-20ths, Breadth .2, of an inch.

Observations.—This beautiful little species is remarkable for its graceful form and beautifully punctured furrows. It is closely allied to the *lineata* (herein described). It differs in being less conical, and in having larger punctures. Only one specimen of these in my possession has the thickened lip. Of the remainder, one seems young, the other broken. Sowerby's figure of *A. Noæ* (Min. Conch. plate 374) has a strong resemblance to this species, but does not seem to have the punctured furrows, or thickened out lip.—[Lea, 1833].

This species has been discussed under *A. pomilius* Conrad. Dall in 1892, identified a "single specimen" from the Caloosahatchie Pliocene beds in Florida as *A. punctatus*. This specimen is No. 97464 in the U. S. Nat. Museum. Through the courtesy of the museum members the specimen has been examined by the author. An included photograph of the specimen (plate 74, fig. 37) was sent by Dr. Paul Bartsch. The illustration was desired so that the differentiation between the Eocene species and the younger form could be elucidated. In several instances where Dr. Dall extended the range of an Eocene species into the Miocene or Pliocene, the specimen so identified, on examination has been found to be distinct.

The Callosahatchie specimen of *Acteon* has punctate sculpture like *A. pomilius* and *A. punctatus.* In shape it is elongate as *A. pomilius* but it differs from that species in having the whorls decidedly shouldered while in *A. pomilius* the slope is continuous from the apex to the body whorl.

Dimensions.—Height, 9 mm.; greatest diameter, 5 mm., lectotype. Height, 7.5 mm.; greatest diameter, 4.5 mm., ? holotype *A. inflatior* Meyer.

Occurrence.—Lower Claiborne: localities 136, 723, 734, 741 and 743. Gosport sand: locality 104 (type).

Acteon idoneus Conrad Plate 74, figs. 19-22; Plate 90, figs. 1, 5, 13

Acteon idoneus Conrad, 1833, Nov. p. 45; H. C. Lea, 1848, p. 95; d'Orbigny, 1850, p. 343; Harris, 1895, p. 22.

Acteon lineatus Lea, 1833, Dec., p. 112, pl. 4, fig. 97; H. C. Lea, 1848, p. 99; de Gregorio, 1890, p. 165, pl. 16, figs. 24-25.

Actæon idoneus Conrad, 1854, App. in Morton, p. 4; Conrad, 1865, p. 34; Conrad, 1866, p. 9; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 5, pl. 1, fig. 4.

Actæon lineatus (Lea) Meyer, 1885, Amer. Jour. Sci., vol. 29, p. 468; Meyer, 1887, Bericht Senckenb. natur. Ges., p. 18; Cossmann, 1893, p. 48; Cossmann, 1895, Essais Pal. Comp., 1 liv., p. 46.

Tornatella bicincta Heilprin, 1879, Acad. Nat. Sci. Phila., Proc. vol. 31, p. 212, pl. XIII, fig. 6.

Narrow-elliptical, with narrow transversely striated sulci, which are distant on the superior portion of the body whorl; folds on the columella elevated and very obtuse, labrum thickened.—[Conrad, 1833].

Nucleus consists of one and a half or two smooth whorls; the spire is elevated and the suture tends to be grooved; the whorls of the spire are smooth except for a revolving punctate groove or two on the upper and lower region of each whorl; there is a wide, smooth area on the upper portion of the body whorl which varies in size.

The spiral grooves do not tend to be as strongly punctate as in *A. pomilius* and *punctatus*. *A. idoneus* and the *pomilius* stock may be related but they are retained as distinct species. *A. idoneus* is typically developed in the Sabine Eocene.

Dimensions.—Height, 11 mm.; greatest diameter, 6 mm., lectotype. Height, 8.5 mm.; greatest diameter, 5 mm., lectotype *A. lineatus* Lea. Height, 7 mm.; greatest diameter, 4 mm., holotype *T. bicincta* Heilprin.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa. No. 5541, A. N. S. lectotype *A. lineatus* Lea. No. 10043/1, Cat. No. 5524/1 Amer. Mus. Nat. Hist. holotype *T. bicincta* Heilprin.

Occurrence.—Sabine Eocene. Lower Claiborne: localities

723, 725, 727, 731 and 741. Gosport sand: locality 104 (type).

Acteon costellatus Conrad

Acteon costellatus Conrad, 1833, p. 45; Conrad, 1834, App. in Morton, p. 4; H. C. Lea, 1848, p. 95; Harris, 1895, p, 13; non *A. costellata* Grateloup,, 1838.
Acteon costellatus d'Orbigny, 1850, p. 343.
Nucleopsis costellatus Conrad, 1865, p. 34.
Actæon costellatus Conrad, 1866, p. 9.

Slightly ventricose, with revolving costae, or sulci which are transversely striated; fold obsolete or wanting; umbilicated.—[Conrad, 1833].

This species was not figured. The type is probably lost.

According to the description, the shell is umbilicated, which would eliminate the species from the *Acteon* group. Conrad placed the species under *Nucleopsis* but that subgenus is not umbilicated.

Acteon clairbornincola de Gregorio Plate 74, figs. 32, 33

Acteon claibornincola de Gregorio, 1890, p. 165, pl. 16, fig. 18; Cossmann, 1893, p. 48 *Actæon.*

Testa ovata, purpoides, laevigata; ultimo anfractu antice irregulariter spiraliter sulcato; apertura angusta, erecta, circiter 5/8 totius longitudinis; columella antice uniplicata.

Cette espèce diffère de l'*A. lineatus* Lea, avec lequel elle a beaucoup d'affinité, par la spire un peu plus turgide et par la surface lisse, les sillons irréguliers et limités à la partie antérieure du dernier tour.

Cette espèce est analogue de la *Tornatella turgida* Deshayes (Desh. Coq. Paris 2 ed. pl. 37, f. 14-15), mais elle est assez différente.—(Coll. mon. Cabinet).—[De Gregorio, 1890].

This form has not been found in the Harris collections. It appears to have the *idoneus* character well developed with the revolving lines absent from the spire and from the superior part of the body whorl.

Holotype.—De Gregorio home, Via Molo 132, Palermo Sicily.

Occurrence.—Gosport sand: locality 104.

Genus **TORNATELLÆA** Conrad, 1860.[706]

Genotype by monotypy *T. bella* Conrad. Sabine Eocene. United States.

Tornatellæa bella Conrad Plate 90, fig. 21

Tornatellæa bella Conrad, 1860, Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 294, pl. 47, fig. 23; Harris, 1899, Bull. Amer. Pal., vol. III, No. 11, p. 6, pl. 1, fig. 6.
Actaeon latus Conrad, 1834, App. in Morton, p. 4.
Acteon latus d'Orbigny, 1850, p. 343.
Actaeon (*Nucleopsis*) *latus* Conrad. 1865, p. 34.
Tornatellæa lala Conrad, 1865, pp. 145, 212, pl. 20, fig. 13; Conrad, 1866,

[706]Conrad, T. A., Acad. Nat. Sci. Phila., 2d ser. Jour. vol. IV, p. 294, 1860.

p. 9.

Subglobose, with numerous revolving lines; spire short, acute; aperture patulous; columella with two distant plaits.

Actæon latus, Conrad Eocene Catalogue, p. 34.

Locality.—Alabama.—[Conrad, 1865, p. 145, *T. lata*].

Suboval, spire acute; whorls 5, convex; body whorl ventricose; ribs close and numerous; columella with 2 distant plaits.

Locality.—Alabama?—[Conrad, 1865, p. 212, *T. lata*].

T. lata has been identified by authors as the *T. bella* Conrad of the Sabine. The holotype and only specimen of *T. lata* is badly worn and Conrad's figure is idealized. The holotypes of *T. bella* and *T. lata* have been compared. The type of *T. lata* is more globose than *T. bella* otherwise it could be the same species. Heilprin erroneously ascribed *T. bella* to the Claiborne. The exact locality of *T. lata* is not known.

Dimensions.—Height, 12 mm.; greatest diameter, 8 mm., lectotype *T. bella* Conrad. Height, 16 mm.; greatest diameter, 11 mm., holotype *T. lata* Conrad.

Holotype.—*T. lata* Conrad, Academy of Natural Sciences, Philadelphia, Pa. Lectotype *T. bella* Con. A. N. S.

Genus NUCLEOPSIS Conrad, 1865.[707]

Genotype by subsequent designation, Cossmann,[708] 1893, *N. subvaricatus* Conrad. Claibornian Eocene.

Nucleopsis subvaricatus (Conrad)

Plate 74, figs. 23, 24, 26; Plate 90, fig. 18

Acteonina subvaricata Conrad, 1860, Acad. Nat. Sci. Phila., Jour., 2d ser., vol. IV, p. 294, pl. 47, fig. 22.

Actæon (Nucleopsis) subvaricatus Conrad, 1865, p. 34.

Actæon subvaricatus Conrad, 1866, p. 9.

Nucleopsis subdivaricatus Tryon, 1883, p. 356, pl., 88, fig. 49 [error in spelling].

Acteon (Nucleopsis) subvaricatus (Conrad) de Gregorio, 1890, p. 166, pl. 16, fig. 37.

Nucleopsis subvaricatus (Conrad) Cossmann, 1893, p. 48, pl. 1, figs. 36-37; Cossmann, 1895, Essais Pal. Comp., 1 liv., p. 56, pl. 1, figs. 18-19 section of *Liocarenus*.

Broadly elliptical; spire short, conical; whirls [sp.] scarcely convex; revolving lines minute, slightly impressed, closely arranged; one or two obscure varices; aperture narrow.

Locality.—Alabama. Dr. Showalter.—[Conrad, 1860].

This form is distinct. An obscure tooth occurs on the inner lip which indicates an affinity of the species with *Acteon.* The varices on some specimens are only suggestive. The callus of the

[707]Conrad, T. A., 1865, p. 34.
[708]Cossmann, M., 1893, p. 48.

inner lip is thin. This genus is closely related to *Liocarenus* of the Paris Eocene, the type of which is *L. conovuliformis* (Deshayes).[709] Cossmann placed *Nucleopsis* as a section of *Liocarenus* Harris and Burrows[710] but Conrad's name has priority in date.

Dimensions.—Height, 10.5 mm.; greatest diameter, 6.5 mm.

Lectotype.—Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: locality 731. Gosport sand: locality 104.

Genus **OVULACTÆON** Dall, 1889[711]

Genotype by original designation *O. Meeki* Dall. Living. Off Cuba and Bahamas.

Ovulactæon aldrichi Wheeler Plate 74, figs. 1, 2

Ovulactæon aldrichi Wheeler, 1910, Nautilus, vol. XXIV, No. 2, June, p. 13; Wheeler, 1910, ibid, vol. XXIV, No. 7, pl. IV, fig. 6.

Shell minute, subcypræform, thick, longitudinally sculptured with distinct grooves very closely set and terminated by the broad oblique callus on the body whorl; periphery of the apical region smooth, well rounded, the diameter of the perforation being contained in the width of the shell about four times; aperture linear, very contracted, elevated; outer lip thickened, reflected over and close to the apical perforation, and produced downward on the body whorl; furnished behind with an oblique, rather deep furrow, which is parallel to the labial contour, and terminating at the callus, a similar, less prominent rectilinear furrow directly in front.

Length 4 mm.; width 2 mm.

Type (No. 779, Col. Wheeler) from the Ferruginous Sand Bed, Claiborne, Alabama. Co-type in the collection of Hon. T. H. Aldrich.

The genus to which this shell belongs is new to Eocene paleontology. Thus far it is represented only by O. meeki Dall, a recent form dredged off the coasts of Cuba and the Bahamas. The genus is thus characterized by Dr. Dall:*

"Shell cypræform, involute; with an apical perforation as in Bulla; columella simple, without plaits; margin of the aperture continuous, simple, thickened, the callus on the body whorl elevated parallel with the outer lip; aperture narrow, almost linear, slightly effuse at the extremities, as long as the shell.

"Type O. meekii, Dall. Plate 33, figs. 3 and 4."

I dedicated this interesting shell to my friend, Hon. T. H. Aldrich, of Birmingham, Alabama, who solved the problem of its generic position, and whose contributions to our knowledge of Tertiary Paleontology are so well known and highly valued. It will be figured on a future plate of this volume.—[Wheeler, 1910].

*Bul. Mus. Comp. Zool. Cambridge, vol. XVII, 1889, p. 42.

Mr. Wheeler generously loaned the type specimen for exam-

[709] Deshayes, G. P., 1824, Tome 2, p. 67, pl. 6, figs. 9, 10, 11, as *Auricle conovuliformis*.

[710] Harris, G. F. and Burrows, H. W., 1891, p. 113, for *Fortisia* Bayan, 1870, non Rondani, 1861.

[711] Dall, W. H., Bull. Mus. Comp. Zool., Harvard, vol. XVIII, p. 42, 1889.

ination. A rear view of the holotype is included.

Holotype.—No. 6245, collection H. E. Wheeler, Birmingham, Alabama.

Occurrence.—Gosport sand. Claiborne, Ala. (Wheeler).

Order **PULMONATA** Cuvier

Family **PLANORBIDÆ**

Genus **PLANORBIS** Müller, 1774.[712]

Genotype by subsequent designation Montfort, 1810,[713] *Helix cornea* Linn. Living. Europe.

Planorbis andersoni Gardner — Plate 76, figs. 1, 2

Planorbis andersoni Gardner, 1927, Wash. Acad. Sci., Jour. 17, No. 14, p. 377, figs. 36, 37; Henderson, 1935, Geol. Soc. Amer., Special Paper, No. 3, p. 244.

Shell small, exceedingly thin, discoidal, depressed on the umbilical, and to a lesser degree, on the apical surface. Whorls five in number, the two earliest included in the protoconch; first whorl of conch constricted at its opening and depressed below the plane of the protoconch; later whorls increasing rather rapidly in diameter and altitude; body relatively high, broadly rounded along the periphery; obtusely rostrate on both the apical and umbilical surfaces. Surface sculptured not developed. Aperture reniform, adnate to the body wall upon the inner surface; less produced and more sharply rounded anteriorly than posteriorly. Umbilical surface funnel-shaped and somewhat scalariform, revealing all of the obtusely carinated posterior extremities of the component whorls.

Dimensions: Altitude, 1.0 millimeter; maximum latitude, 2.2 millimeters; latitude, at right angles to maximum latitude, 2.0 millimeters.

Holotype.—U. S. Nat. Mus. Cat. No. 369235.

Type locality.—Three-fourths of a mile south of Elkhart, Anderson County, Texas.

Geologic horizon.—Cook Mountain formation (lower part of the Claiborne group).

This fresh-water genus has not been previously reported from the Eocene of Texas. It is fairly common at the single locality at which it is represented.—[Gardner, 1927].

Doubtful Position

The following new genus, new species was omitted from its proper position earlier in the text. Casey placed the species in the Eulimidæ pointing out the resemblance to *Hoplopteron* Fischer. The characters suggest fresh or brackish water affinities.

[712]Müller, O. F., 1774, p. 152.

[713]Montfort, D., 1810, p. 270; Baker, F. C., Zool. Soc. Lond., pt. II, p. 583, 1931; Baker, F. C., Wisc. Acad. Sci. Arts, and Letters, vol. 22, p. 200, 1926.

Genus PTEREULIMA Casey, 1902.

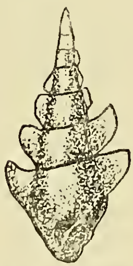
Genotype by monotypy *P. elegans* Casey. Claibornian Eocene. Louisana.

Ptereulima elegans Casey

Ptereulima elegans Casey, 1902, Nautilus, vol. XVI, No. 2, p. 18, text fig.

Almost evenly conical, the surface shining, the more recent whorls perhaps a little more rapidly increasing in size than the first three or four, the apex acute with the embryonic whorls two in number and very minute, the next three small and simple, the five succeeding similar to the preceding three except in possessing, at each side, a large obtuse aliform process as shown in the figure. Umbilicus rimate. Inner lip defined throughout by callus, which is slightly reflected along the umbilicus. Surface of all the whorls feebly and evenly convex, the suture fine and simple but distinct. Length 3.5 mm.

Lower Claiborne Eocene (St. Maurice, La.).



Ptereulima elegans Casey

The outer lip is broken away in the unique type, but undoubtedly possessed an aliform projection similar to that immediately above it. The processes are of the nature of thin varices which served to protect the animal, and the growth of the shell between these temporary arrests was probably very rapid.—[Casey, 1902].

Class CEPHALOPODA

Order DIBRANCHIATA

Suborder DECAPODA

Family BELOSÆPIIDÆ

Genus BELOSÆPIA Voltz, 1830.[714]

Genotype by original designation *Beloptera sepioidea* Blainville=*Belosæpia cuvieri* (d'Orbigny). Middle Eocene. Belgium and France. Middle and Upper Eocene. England.

Belosæpia ungula Gabb Plate 77, figs. 2, 3, 5, 6, 7, 14

Sepia (*Belosepia*) *ungula* Gabb, 1860, Acad. Nat. Sci. Phila., Proc. vol. 12, p. 324; Gabb, 1860, Acad. Nat. Sci. Phila., Jour. 2 d ser. vol. IV, p. 376, pl. 67, figs. 1, 2, 3, 4.

Belosepia ungula Conrad, 1865, p. 16; Conrad, 1866, p. 19; de Gregorio,

[714]Voltz, M., 1830, pp. 22-23.

1890, p. 15; Cossmann, 1893, p. 51, pl. II, figs. 8-10.

Shell laterally compressed, especially posteriorly; beak robust, acute, arcuate, and with a very faint ridge on the dorsal surface; ventral plate smaller in proportion than in the other species of this subgenus, slightly undulate and radiate, edge smooth and sharp; dorsal callus straight, deeply rugose, marked on the edge by about three irregular rugæ and covered on the face and sides with pits or cavities, which extend on the sides almost to the base of the ventral plate, becoming gradually fainter until they disappear; cavity shallow, ventral edge sharp, interior marked by numerous compound concentric ribs crossed by very faint longitudinal lines.

Dimensions.—Length 1½ inch, length of rostrum ¾ in., width of the ventral plate ¾ inch, just above the base of the cavity.

The specimen figured is in the Academy's collection, and is somewhat smaller than the above measurements which were taken from a specimen now in the Smithsonian collection.

Locality.—Wheelock, Texas.

This species resembles more nearly *Sepia Cuvieri* Desh., of the Paris basin than any other, but can readily be distinguished from it by the dorsal callosity, which in our species is not so prominent, and is comparatively sharp, especially towards the extremity nearest the rostrum. The roughening of the surface of the same portion is, in the Paris species, transverse, while in ours it is longitudinal. The ventral plate is one third smaller, in the present species, than in *S. Cuvieri.*—[Gabb, 1860, Jour. 2d ser. vol. IV].

The type of this species is a good specimen. In the original illustration parts of the shell are slightly restored. The specimen figured herein from Smithville, Texas is typical.

Two specimens in the Harris collections, one of *B. ungula* and the holotype of *B. veatchi* have the thin, calcareous layer, covering the inner cavity of the sheath preserved. This interior layer is composed of regular concentric, converging, sutural lines or divisions. They converge at the ventral margin of the cavity and the ventral plate. When the inner layer is not preserved the surface of the cavity shows a regular concentric, undulating surface. On the surface of the ventral plate are wide, undulating radiations.

Heretofore specimens of *Belosæpia* in collections from the Claibornian usually have been labelled *B. ungula* Gabb. The collections studied reveal a fairly large number of specimens from several localities. They exhibit pronounced differences from *B. ungula.* These new species, with Gabb's *B. ungula* increase the known American species of *Belosæpia* to a number comparable to that of the European. In the southern Eocene, the genus is so far limited to the Claibornian. The greatest difference between the American species and the European type[715] is in the character

[715]Newton, R. B. and Harris, G. F., Proc. Mal. Soc. Lond., vol. I, pp. 119-121, pl. X, figs. 1, 2, 3, 1894.

of the dorsal callus surface of the belosepion.

Dimensions.—Height, 13 mm.; width alveolus, 8 mm.; width ventral plate, 5.5 mm.; greatest diameter rostrum, 5 mm., holotype.

Holotype.—No. 12759, Academy of Natural Sciences, Philadelphia, Pa.

Occurrence.—Lower Claiborne: Wheelock, Texas (type); locality 733. Gosport sand: locality 104.

Belosæpia uncinata, new species Plate 77, figs. 8, 9, 18, 20, 21

Belosepion large, elongate; rostrum elongate, sharp; regularly sloping at the anterior, dorsal margin of the rostrum; callus deeply rugose, the rugosity has a primary pattern of parallel, longitudinal grooves in the mid-region of the area, the grooves are connected by irregular, transverse ridges giving an irregular pitted appearance; the longitudinal grooves converge posteriorly; the dorsal surface of the callus consists of one plane and is not convex or sharply arched as in some species of *Belosepia;* ventral plate oblong in shape, narrow posteriorly, the margin not serrate; surface finely striate; there is a concavity laterally, above the lateral margins of the alveolus; a small rounded emargination in the internal margin of the ventral plate occurs at the basal apex of the alveolus; this character appears to be definite and not an irregularity due to erosion, because it occurs on five different specimens from four different localities; however another specimen, from another locality, lacks such a concavity in the basal terminal apex of the caxity; faint converging concentric undulations occur on the surface of the cavity.

B. uncinata differs from *B. ungula* Gabb in being larger, having a longer, less inclined rostrum, the rostrum less inflated at its anterior end. The anterior dorsal area of the rostrum is less concave than *B. ungula.* The callus in *B. ungula* is more finely pitted posteriorly and lacks the longitudinal grooves. The ventral plate in *B. uncinata* is narrower, more oblong, the portion beneath the base of the rostrum is less convex. The lateral concave areas are larger on *B. ungula.* The shape of the alveolar cavity is different in the two species. The apical area is more broadly rounded in *B. ungula* and the apical margin lacks the small, rounded emargination. None of the other Claibornian species exhibits such a character. The author has not seen it illustrated on any of the European species of *Belosæpia.* Such a character may as Edwards[716] and Voltz[716] suggest, indicate a siphonated shell.

Other differences between *B. uncinata* and related species will be brought out under the description of the new species.

Holotype.—No. 3407, paratypes Nos. 3406 and 3410, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 103, 724, 741 and 778.

Belosæpia veatchi, new species Plate 76; figs. 3, 4, 5

Belosepion large, elongate; rostrum produced, the dorsal line of the rostrum extends nearly straight posteriorly, the entire rostrum does not curve dorsally as in most of the Claibornian species. The callus is deeply rugose. The pattern shows longitudinal grooves, converging posteriorly as in *B. uncinata.* The ventral plate is large and in the adult the surface has coarse folds giving the posterior margin a rough edge.

This species differs from *B. uncinata* with which it approaches in size, in having the rostrum less concave dorsally and in the ventral plate being broader posteriorly, more convex centrally and having stronger radiating folds.

Named in honor of A. C. Veatch who collected the specimens.

Holotype.—No. 3401, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 724.

Belosæpia alabamensis, new species Plate 77, figs. 1, 15

Belosepion medium in size and short; rostrum convex ventrally and pointed dorsally; callus broken, probably deeply rugose; ventral plate, large, extending well over the base of the rostrum. The illustration does not show a wide space between the rostrum and the margin of the plate; broadly rounded at the posterior end; in the contour the ventral plate is flat or only slightly raised in the middle with the lateral portions extending ventrally giving the whole plate a hollow character; surface of the plate has fine, radiating lines.

The distinguishing character of *B. alabamensis* is the curvature of the ventral plate. In shape it approaches *B. ungula* Gabb but

[716]Edwards, F. E., Pal. Soc., The Eocene Mollusca, pt. 1, Cepholpoda, p. 26, 1849; Voltz, M., 1830, p. 22.

differs from that species in the character of the ventral plate. *B. ungula* has the central portion of the plate convex and the lateral wings directed dorsally while in *B. alabamensis,* the flaring of the lateral wings is ventrally, the general outline of the plate being concave while in *B. ungula* it is convex-concave from the central line laterally.

Holotype.—No. 3403, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 103.

Belosæpia alabamensis voltzi, new variety Plate 77, figs. 10, 12

Belosepion medium; rostrum convex centrally and pointed dorsally; callus narrow, deeply rugose with parallel grooves and ridges; ventral plate broken; probably of the character of *B. alabamensis.*

On the similarity of the ventral plate and posterior outline of the elongated point of the rostrum this form is united with *B. alabamensis.* By the difference in the dorsal outline of the rostrum, just below the callus, the shell is separated from *B. alabamensis* as a variety. Where *B. alabamensis* is convex in the outline of the rostrum this form is concave. The amount is great enough probably to be of anatomical difference.

Holotype.—No. 3408, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 103.

Belosæpia saccaria, new species Plate 77, figs. 4, 13, 16

Belosepion medium in size and short; rostrum short and pointed dorsally; the ventral, anterior line convex, remainder of the ventral margin straight; callus finely rugose, convex to the dorsal, anterior area of the rostrum, hanging like a pouch; the ventral plate is finely folded, with radiating lines; while the pouch-like area is inflated dorsally, laterally on both sides; in the ventral area there is a slight concavity giving a pinched-in appearance.

This species is represented by three eroded specimens from Lisbon, Alabama. But the character of the pouch-like outline of the callus area is distinct and differentiates the form from associated species. The belosepion is short, with a short rostrum as in *B. ungula, B. harrisi* and *B. alabamensis.*

Holotype.—No. 3404, Paleontological Research Institution.

Occurrence.—Lower Claiborne: localities 734 and 778.

Belosæpia harrisi, new species Plate 77, figs. 11, 17, 19

Belosepion short and robust; rostrum probably short, convex; callus deeply and irregularly rugose, convex in outline, terminating convexly posteriorly; the ventral plate is flat, oblong in shape, margin entire; lateral portions of the ventral plate broken; alveolar cavity shallow.

This species has the most inflated, robust belosepion of any of the Clabornian species of *Belosæpia*. The pits in the callus are larger than those of the other species except *B. veatchi* with which they are similar in size. The flatness of the posterior portion of the ventral plate differentiates the species from those associated with it.

Named in honor of G. D. Harris who collected the holotype from the base of the bluff at Claiborne, Ala.

Holotype.—No. 3409, Paleontological Research Institution.

Occurrence.—Lower Claiborne: locality 103.

[illegible] v 15 p 90, 1941

= Anevda [illegible] p. 285

Family BELOSPERIDÆ

Genus ADVENA, new genus

Genotype *A. floweri*, n. sp. Gosport sand, Claiborne, Ala.

Belosepion small, composed of an elongate sheath, containing a rounded body cavity, a short rostrum and a fine, flattened dorsal callus. The tip of the rostrum is broken. The dorsal callus is finely rugose, expanded and flattened over the whole dorsal surface. The alveolus has an inner calcareous layer. The cavity becomes constricted posteriorly, its entire surface is covered by the calcareous inner layer. The tip of the alveolus may curve ventrally. The calcareous inner layer has definite, concentric septæ as in *Belosæpia*. Ventrally, the sheath, anterior to the rostrum is enlarged, expanding laterally but with a deep, short concavity at the margin of the alveolus. The surface of the enlarged area is minutely granular as is most of the surface of the sheath.

The genotype *A. floweri* is unique. It is represented by a single specimen which with the exception of the broken tip of the rostrum is perfect. The genus consists of two species from the Clabornian of America, the genotype, *A. floweri* from the Gosport sand and *A. americana* (Meyer and Aldrich) from the lower Claiborne at Wautubbee, Miss.

The genus is related to *Spirulirostra* d'Orbigny[717] and *Belemnosis* Edwards[718]. The two genera have been grouped as the same[719] and at least represent closely related forms.

Spirulirostra is known from the Miocene of Germany, Australia and Mexico[720] and from the Oligocene of Galicia and Westphalia. One species of *Belemnosis* is known from the lower Eocene (London clay) of England.

The two American species of the related *Advena* are of particular interest in increasing the distribution and knowledge of the character of this group of dibranchiate cephalopods.

Advena differs from *Spirulirostra* in having a shorter rostrum and in having a greater expanded alveolar cavity. The area of the ventral base of the rostrum in *Advena* is less enlarged and there is a greater concavity anterior to it. In *Advena* the whole dorsal area is flatly rugose.

Newton and Harris believed the *Belemnosis anomala* (Sowerby)[721] (=*B. plicata* Edwards) monotype of *Belemnosis* Edwards was a worn specimen and did not exhibit the true character of the species. They reconstructed the form as having characters which generically are synonymous with *Spirulirostra* d'Orbigny. Even as reconstructed *S. anomala* in the ventral area of the sheath, in a greater curvature of the chambered shell and in the dorsal rugose area, differs from *Advena*.

Advena Americana (Meyer and Aldrich) Plate 76, figs. 13, 14

Belemnosis Americana Meyer and Aldrich, 1886, Cincinnati Soc. Nat. Hist., Jour. vol. IX, No. 2, p. 47, pl. II, figs. 26, 26a.

Phragmocone rather long, straight, with horizontal sutures. Rostrum obtusely conical below, quadrangularly flattened above.

Wautubbee.

Only one specimen of this genus has heretofore been known. It is from the London clay, and seems to be less perfect than our type.—[Meyer and Aldrich, 1886].

Additional material of this species has apparently not been

[717] d'Orbigny, A., Annales des Sciences Naturalles, Paris, 2d ser., Zoologie, tome XVII, p. 374, pl. 11, figs. 1-6, 1842.

[718] Edwards, F. E., Mon. Pal. Soc., p. 38, pl. II, fig. 40, 1849.

[719] Newton, R. B. and Harris, G. F., Mal. Soc. Lond., Proc., 1, pp. 123-125, text figs., 1895.

[720] Berry, E. W., Amer. Jour. Sci., 5th ser. vol. III, No. 17, pp. 327-334, text figures, 1922.

[721] Sowerby, J., Min. conch., vol. VI, p. 184, pl. 591, fig. 2, 1829 as *Beloptera anomala*.

found. The Harris collections yield a single specimen of the same genus but specifically distinct from *A. Americana.* The specimen came from the Gosport sand.

Holotype.—Not found[722].

Occurrence.—Lower Claiborne: Wautubbee, Miss.

Advena floweri, new species Plate 76; figs. 10, 11, 12, 15

The description of the species has been given under the genus. *Advena floweri* differs from *A. americana* (Meyer and Aldrich) in having a longer rostrum, and in the ventral area, anterior to the rostrum having a greater enlargement. *A. americana* does not have the dorsal rugose area as in *A. floweri.*

Named in honor of Rousseau H. Flower, Geology Department, University of Indiana, Bloomington, Ind.

Dimensions.—Length, 15 mm.; greatest width, 6.5 mm.

Holotype.—No. 3402, Paleontological Research Institution.

Occurrence.—Gosport sand: locality 104.

[722]Search was made in the Geology Department, Johns Hopkins University, Baltimore, Md., and in the Alabama Museum of Natural History, University, Ala.

BIBLIOGRAPHY

Those references given on p. 9 used most in the synonymy of species are not repeated in this list.

Adams, Arthur.

1860. On some new genera and species of Mollusca from Japan. Ann. Mag. Nat. Hist., 3d ser. vol. V, pp. 299-303, 405-413.

1860. Mollusca Japonica: New species of Odostomia. Ann. Mag. Nat. Hist. 3d ser. vol. VI, pp. 20-22.

1861. On some new species of Eulima, Leiostraca, and Cerithiopsis from Japan. Ann. Mag. Nat. Hist., 3d ser. vol. VII, pp. 125-131.

1863. On the genera and species of Liotiinæ found in Japan. Proc. Zool. Soc. London, pp. 71-76.

1864. On the species of Pyramidellinæ found in Japan. Jour. Proc. Linn. Soc. London, (Zool.), vol. VII, pp. 1-6.

Adams, Charles Baker.

1850. Monograph of Vitrinella, a new genus of new species of Turbinidæ. Amherst, Mass.

Adams, Arthur and Henry.

1853-58. The Genera of Recent Mollusca; arranged according to their organization. 2 vols. text, 1 vol. plates. London. Dates of publication by page given on p. 661, vol. II.

Aldrich, Truman Hemingway.

1885. Observations upon the Tertiary of Alabama. Amer. Jour. Sci., vol. XXX, pp. 300-308.

1885. Notes on the Tertiary of Alabama and Mississippi, with descriptions of new species. Jour. Cincinnati Soc. Nat. Hist., vol. VIII, No. 2, pp. 145-153, 2 pls.

1885. Notes on Tertiary fossils, rare, or little known. ibid. pp. 153-155, figures, on pl. with above.

1886. Preliminary report on the Tertiary fossils of Alabama and Mississippi. Geol. Sur. Ala., Bull. No. I, pt. 1, 60 pp. 6 pls.

1886. Under Meyer, O. and Aldrich, T. H.

1887. Notes on Tertiary fossils, with descriptions of new species. Jour. Cincinnati Soc. Nat. Hist., vol. X, No. 2, pp. 78-83.

1890. A new Eocene fossil from Texas. The Nautilus, vol. IV, No. 3, p. 25, text fig., July.

1894. New Tertiary fossils from Red Bluff, Mississippi. The Nautilus. vol. VII, No. 9, January, pp. 97-99, 1 pl.

1894. The (Midway) Clayton Tertiary section and its fossils. pp. 240-248, 4 pls. in Report of the Geology of the Coastal Plain of Alabama by Smith, E. A. and others. Bull. Geol. Sur. Ala.

1895. New or little known Tertiary Mollusca from Alabama and Texas. Bull. Amer. Pal., vol. I, No. 2, 30 pp., 5 pls.

1897. Notes on Eocene Mollusca, with descriptions of some new species. Bull. Amer. Pal., vol. II, No. 8, 26 pp., 5 pls.

1903. New species of Tertiary fossils from Alabama, Mississippi and Florida. The Nautilus, vol. XVI, No. 9, pp. 97-101, 2 pls.,

1908. A new Eocene fossil from Claiborne. The Nautilus, vol. XXII, No. 2, p. 13, text fig.

1908. New Eocene fossils from Alabama and Mississippi. The Nautilus, vol. XXII, No. 8, pp. 74-76, 1 pl.
1910. New Eocene fossils from the southern States. The Nautilus, vol. XXIV, No. 7, pp. 73-75, 1 pl., November.
1911. New Eocene fossils from the southern Gulf States. Bull. Amer. Pal., vol. V, No. 22, 24 pp., 5 pls.
1921. New Eocene species from Alabama. Bull. Amer. Pal., vol. IX, No. 37, 32 pp., 3 pls.
1923. New molluskan names. Proc. Biol. Soc. Wash., vol. 36, p. 199.
1931. Description of a few Alabama Eocene species and remarks on varieties with plates. Ala. Museum of Nat. Hist., Mus. Paper No. 12, 21 pp., 6 pls.

Angus, George French.
1871. Descriptions of thirty-four new species of shells from Australia. Proc. Zool. Soc. London, pp. 13-21, 1 pl.

Bartsch, Paul.
1904. Under Dall, W. H.
1907. New marine mollusks from the West Coast of America. Proc. U. S. Nat. Mus., vol. XXXIII, No. 1564, pp. 177-183.
1909. Under Dall, W. H.
1917. Monograph of West American Melanellid mollusks U, S. Nat. Mus., Proc. vol. 53, No. 2207, pp. 295-356, pls. 34-39.
1923. A key to the family Terebridae. The Nautilus, vol. XXXVII, No. 2, pp. 60-64.

Bayle, Emile.
1880. Liste rectificative de quelques noms de genres et d'espèces. Jour. de Conchyl., vol. XXVIII, 3 ser. tome XX, pp. 240-251.
1880. In Jousseaume, Felix.
1885. In Fischer, Paul.

Bellardi, Luigi.
1872. I Molluschi dei terreni terziarii del Piemonte e della Liguria. Pt. I.
1882. Ibid. Pt. III. Gasteropoda (Buccinidae, Cyclopsidae, Purpuridae, Coraliophilidae, Olividae). 253 pp., XII pls.
1884. Ibid. Pt. IV. Fasciolaridae e Turbinellidae. 62 pp., II pls.
1887. Ibid. Pt. V. Mitridae. 85 pp., II pls. Pt. V. Mitridae (continuazione). 72 pp. II pls.
1888. Ibid. Mitridae (fine). 52 pp., II pls.

Berry, Edward W.
1922. An American Spirulirostra. Amer. Jour. Sci., No. CCIII, 5th ser. vol. III, No. 17, pp. 327-334, 5 figs.

Blainville, Henri-Marie Ducrotay de.
1825. Manuel de Malacologie et de Conchyliologie;————2 vols. Text. 664 pp., 1825. 87 planches, 1827. Paris.
1828. Dictionnaire des Sciences Naturelles, (Complete work edited by Cuvier. Vers and Zoophytes, 10 vols. by Blainville, vol. 55.

[Hughes], Bolten, Beatrice Edith.
1931. The Gastropoda of the Barton (Upper Eocene). Ph. D. thesis Cornell University, Ithaca, N. Y. 288 pp., 62 pls.

Bolten, Joachim Friedrich.
1798. Museum Boltenianum sive Catalogus cimeliorum e tribus regnis naturæ. Pars 2. Conchylia sive Testacea univalvia, bivalvia & multivalvia. VIII+ 198 pp. Hamburg. Reprint by C. Davies Sherborn and E. R. Sykes, 1906. Index see under Dall, W. H.

Boury, Eugène Aubourg de.
1886. Monographie des Scalidae vivants et fossiles. Pt. I, fasc. I: Sousgenre, Crisposcala.
1887. Etude critique des Scalidae Miocènes et Pliocènes d'Italie. Bull. Soc. Mal. Italiana, vol. XV, pp. 81-213.
1909. Catalogue des sous-genres de Scalidæ. Jour. de Conchyl., vol. 57, pp. 255-258.
1910. Etude sur les sous-genres de Scalidæ, vivants et fossiles. Jour. de Conchyl., vol. 58, 4th ser. t. XII, pp. 212-260, 2 pls.
1912. Description de Scalidae nouveaux ou peu connus. Jour. de Conchyl., tome LX, 4th ser. t. XIV, pp. 86-107, 169-196, 269-322, pls. VII-XI.
1917. Révision critique de l'étude des Scalaires faite par M. Cossmann dans les "Essais de Palêoconchologie", Jour. de Conchyl., vol. 63, pp. 13-62.
1918. Etude sure les Scalaires de la côte Pacifique Américaine a propos d'un récent travail de M. Dall. Jour. de Conchyl., vol. 64, pp. 33-40.

Bowdich, T. Edward.
1882. Elements of Conchology, including the Fossil Genera and the Animals. Pt. I. Univalves. Pt. II. Bivalves and Multivalves. Tubicolæ.

Brander, Gustavo. See Solander, D. C.
1766. Fossilia Hantoniensia collecta, et in Musæo Britannico deposita. London. 43 pp. 9 pls.

Brocchi, Giovanni Battista.
1814. Conchiologia Fossile Subapennina con osservazioni geologiche sugli Appennini e sul suolo adjacente con travole. 2 vols., (vol. I general discussion, pp. 1-240; vol. 2 discussion of fossils), pp. 241-712, 16 pls. Milan.

Bronn, Heinrich Georg.
1848. Index Palæontologicus oder übersicht der bis jetzt bekannten Fossilen Organismen, unter mitwirkung der HH. Prof. H. R. Göppert und Herm. v. Meyer. Pt. I. Nomenclator palæontologicus . . . vol. I, A-M, 775 pp., vol. II, N-M, pp., 777-1381 Stuttgart.
1849. Ibid. Pt. II. Enumerator palæontologicus . . . 980 pp., Stuttgart.

Bruguière, Jean Guillaume.
1789. Histoire Naturelle des Vers et des Mollusques. Encyclopédie Méthodique VI. Vol. I, 344 pp.
1792. Ibid. Vol. II, pp. 345-758. For dates of plates see Newton, R. B., 1891; Sherborn, C. Davies and Woodward, B. B., Ann. Mag. Nat. Hist., 7th ser. vol. XVII, pp. 577-582, 1906.

Bucquoy, E. Dautzenberg, Ph. and Dollfus, Gustave F.
1882-1886. Les Mollusques marins du Roussillon. Tome I. Gasteropodes. 570 pp., 66 pls.; Feb. 1882 to Feb. 1886 included in Bull. de la Société d'Etudes scientifiques de Paris.

Burrows, H. W., Under Harris, G. and Burrows, H. W.

Bush, Katharine Jeannette.
1885. List of the shallow-water mollusca dredged off Cape Hatteras by the Albatross in 1883. Rep. U. S. Fish Comm., 11, pp. 579-595.
1897. Revision of the marine gastropods referred to Cyclostrema, Adeorbis, Vitrinela, and related genera; with descriptions of some new genera and species belonging to the Atlantic Fauna of America. Trans. Conn. Acad. Arts and Sci., vol. X, pt. I, pp. 97-144, pls. XXII, XXIII, text figs. (vol. 1899).

Call, R. Ellsworth.
1891. Annual Report of the Geological Survey of Arkansas for 1889, vol. II, pp. 3-14. Publ. 1891.

Casey, Thomas L.
1902. A new genus of Eocene Eulimidæ. The Nautilus, vol. XVI, No. 2, pp. 18, 19, text fig.
1904. Notes on the Pleurotomidæ with descriptions of some new genera and species. Trans. Acad. Sci. St. Louis, vol. XIV, No. 5, pp. 123-170.

Chemnitz, J. H. Under **Martini, F. H. W.** and **Chemnitz, J H.**

Chenu, J. C.
1859-1862. Manuel de Conchyliologie et de Paléontologie Conchyliologique, 2 vols. vol I Céphalés, 508 pp. text figs. vol. II, Acéphalés, 327 pp. text figs. Paris.

Children, J. G
1823. Lamarck's Genera of Shells, Translated from the French, With plates from original drawings by Miss Anna Children. Quarterly Jour. Sci., vol. XIV, Oct. 1822, pp. 64-85; vol. XIV, Jan. 1823, pp. 298-322; vol. XV. Apr. 1823, pp. 23-52; vol. XV, July, 1823, pp. 216, 258; vol. XVI, Oct. 1823, pp. 49-79; vol. XVI, Jan. 1824, pp. 241-264. See Kennard, etc. for reprint.

Clark, Bruce Lawrence and Palmer, Dorothy Kemper.
1923. Revision of the Rimella-like Gastropods from the West Coast of North America. Univ. California Pub. Geol. Sci. Bull., vol. 14, No. 7, pp. 277-288, pl. 51, October 31.

Clark, Bruce L. and Vokes, H. E.
1936. Summary of Marine Eocene sequence of western North America. Bull. Geol. Soc. Amer., vol. 47, No. 6, pp. 851-877, 2 pls.

Clark, William Bullock
1895. Contributions to the Eocene fauna of the Middle Atlantic Slope. Johns Hopkins Univ. Circ. vol. XV, pp. 3-6.
1896. The Eocene deposits of the middle Atlantic slope in Delaware, Maryland, and Virginia. Bull. U. S. Geol. Sur., No. 141, 167 pp., XL pls.

Clark, William Bullock and Martin, George Curtis.
1901. Mollusca in Eocene deposits of Maryland. Maryland Geol. Sur. Eocene. 331 pp., LXIV pls.

Collins, R. Lee.
1934. A monograph of the American Tertiary Pteropod mollusks. Johns Hopkins University Studies in Geology, No. 11, pp. 137-234, pls. VII-XIV.

Conrad, Timothy Abbott
1833. On some new fossil and Recent Shells of the United States. Amer. Jour. Sci. and Arts, vol. XXIII, January, No. II, pp. 339-346.
1834. Appendix to description of new Tertiary fossils from the southern States. Jour. Acad. Nat. Sci. Phila., vol. VII, pt. I., pp. 130-157.
1842. Observations on a portion of the Atlantic Tertiary region, with a description of new species of organic remains. 2d Bull. Proc. National Institution, pp. 171-192 .
1846 Observations on the Eocene formation of the United States, with descriptions of species of shells, etc. occurring in it. Amer. Jour. Sci., 2d ser. vol. I, pp. 209-221, 2 pls.
1847. Descriptions of new Eocene fossils in the cabinet of Lardner Vanuxem. Acad. Nat. Sci. Phila., Proc. vol. 4, pp. 297-299.

1848. Observations on the Eocene formation, and descriptions of one hundred and five new fossils of the period, from the vicinity of Vicksburg, Mississippi; with an Appendix. Jour. Acad. Nat. Sci. Phila., 2d ser., vol. I, pp. 111-134, 4 pls.
1853. Synopsis of the genera Cassidula, Humph., and a proposed new genus Athleta. Acad. Nat. Sci. Phila., Proc. vol. 6, pp. 448-449.
1854. Rectification of the generic names of Tertiary fossil shells. Proc. Acad. Nat. Sci. Phila., vol. VII, pp. 29-31.
1854. Fossil Testacea of the Tertiary Green-sand Marl-bed of Jackson, Miss. p. 289, pls. XIV-XVII, in Wailes, B. L. C., Report on the Agriculture and Geology of Mississippi.
1855. Observations on the Eocene deposits of Jackson, Mississippi, with descriptions of thirty-four new species of shells and corals. Proc. Acad. Nat. Sci. Phila., vol. VII, pp. 257-263.
1860. Descriptions of new species of Cretaceous and Eocene fossils of Mississippi and Alabama. Jour. Acad. Nat. Sci. Phila., 2d ser. vol. IV. pp. 275-298, 2 pls.
1871. Paleontological notes. Amer. Jour. Conch., vol. VI, pp. 314-315, pl. 13.

Cooke, Charles Wythe.
1926. New Eocene mollusks from Jackson, Miss. Jour. Washington Acad. Sci., vol. 16, No. 5, pp. 132-138, 1 pl.
1936. Geology of the Coastal Plain of South Carolina. Bull. U. S. Geol. Sur. No. 867, 196 pp, maps.

Cooke, C. Wythe and Stephenson, Lloyd W.
1928. The Eocene age of the supposed late upper Cretaceous Greensand marls of New Jersey. Jour. Geol. vol. XXXVI, No. 2, pp. 139-148.

Cossmann, Maurice.
1888-1913. Catalogue illustré des Coquilles Fossiles de l'Eocène des environs de Paris. Scaphopodes and Gastropodes. Annales Société Royale Malacologique Belgique, tome XXIII, 4th ser. t. III, pp. 3-324, pls. I-XII, 1888; t. XXIV, 4th ser. t. IV, pp. 3-381, pls. I-XII, 1889; Appendice No. 1, t. XXVIII, pp. 1-17, text figs. 1893; App. No. 2., t. XXXI, pp. 3-94, pls. 1-3, 1896; App. No. 3, t. XXXVI, pp. 9-110, pls. II-VII, 1901; App. No. 4, t. XLI, p. 186-286, pls. V-X, 1906; App. No. 5, t. XLIV, pp. 19-238, pls. I-VIII, 1913.
1895-1925. Essais de Paléoconchologie Comparée. 13 livraisons. For dates and contents of separate livraisons see 13 liv., pp. 5, 6.
1892. Annuaire Géologique Universel, Revue Géologie et Paléontologie, Gastropodes [review of DeGregorio's monograph of the Eocene of Alabama], Année 1890, tome VII, pp. 992-1004.

Cossmann, Maurice and Pissarro, G.
1910-1913. Iconographie Complète des Coquilles fossiles de l'Eocène des environs de Paris. Scaphopodes, Gastropodes, Brachiopodes, Cephalopodes & Supplement. Tome 2, 65 pls.

Cossmann, Maurice.
1914. In Martin, Karl.

Cossmann, Maurice and Peyrot, A.
1916. Conchologie Neogenique de l'Aquitaine. Scaphopodes et Gastropodes, T. III, Actes Société Linnéene de Bordeaux, tome LXIX, 709 pp.
1922. Ibid, Gastropodes. Tome IV, liv. I. Ibid, t. LXXIII, 321 pp.

Cox, L. R.

1927. Neogene and Quaternary Mollusca from the Zanzibar Protectorate. Report on the Palæontology of the Zanzimar Protectorate. pp. 13-102, pls. III-XIX.

1931. Sycostoma, a renamed genus of lower Tertiary gastropoda. Proc. Mal. Soc. Lond., vol. XIX, pt. VI, p. 291.

Crosse, H

1861. Etude sur le genre Cancellaire, suivie du catalogue des espèces vivantes et fossiles actuellement connus. Jour. de Conchyl., t. IX, ser. 3, t. I., pp. 220-256.

1877. (Note) Nouvelles. Jour. de Conchyl. vol. 25, 3d ser. t. XVII, pp. 97-99.

Cuvier, G. See Griffith, Edward and Pidgeon, Edward.

Dall, William Healey.

1881. Reports on the results of dredging under the supervision of Alexander Agassiz, in the Gulf of Mexico and in the Caribbean Sea, 1877-79, by the U. S. Coast Survey Steamer "Blake," Lieutenant-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N. commanding. XV. Preliminary report on the Mollusca. Bull. Mus. Comp. Zool. Harvard, vol. IX, No. 2, pp. 33-144.

1889. Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (177-78) and in the Caribbean Sea (1879-80), by the U. S. Coast Survey steamer "Blake," Lieut-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., commanding. XXIX. Report on the mollusca. pt. II. Gastropoda and Scaphopoda. Bull. Mus. Comp. Zool. Harvard College, vol. XVIII, 492 pp., X-XL.

1895. Diagonoses of New Tertiary fossils from the southern United States. Proc. U. S. Nat. Mus., vol. 18, pp. 21-45.

1896. On some new species of Scala. The Nautilus, vol. IX, No. 9, January, pp. 111-112.

1904. An historical and systematic review of the Frog-shells and Tritons. Smith. Misc. Coll., vol. XLVII, No. 1573, pp. 114-144.

1906. Early history of the generic name Fusus [includes a list of new names introduced by Bolten with species], Jour. Conch., vol. 11, No. 10, April, pp. 289-297.

1906. Note on some names in the Volutidæ. The Nautilus, vol. XIX, No. 12, April, pp. 143-144.

1907. Review of American Volutidæ. Smith. Misc, Coll., vol. 48, No. 1663, pp. 341-373.

1905, 1907. Thomas Martyn and the Universal Conchologist. Proc. U. S. Nat. Mus., vol. 29, pp. 415-432, (1906); ibid, vol. 33, pp. 185-192, (1908).

1908. Subdivisions of the Terebridæ. The Nautilus, vol. XXI, No. 11, pp. 124-125.

1907. Footnote in Bartsch, Paul. Proc. U. S. Nat. Mus., vol. 33, No. 1564, p. 178. See under Bartsch.

1907. Correspondence on Volutidæ. The Nautilus, vol. XX, No. 12, April, pp. 142-143.

1908. Reports on the dredging operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. Reports on the scientific results of the expedition to the eastern tropical Pacific, in charge of Alexander Agassiz, by the U. S. Fish Commission steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U. S. N., commanding. The mollusca and the brachiopoda. Bull. Mus. Comp. Zool. Harvard College, vol. XLIII, No. 6, pp. 205-487, 22 pls.

1909. Contributions to the Tertiary Paleontology of the Pacific Coast I. The Miocene of Astoria and Coos Bay, Oregon. U. S. Geol. Sur., Prof. Paper No. 59, 278 pp. 23 pls.

1915. A monograph of the molluscan fauna of the Orthaulax pugnax zone of the Oligocene of Tampa, Florida. U. S. Nat. Mus. Bull. 90, 173 pp. 26 pls.

1916. A contribution to the invertebrate fauna of the Oligocene beds of Flint River, Georgia. Proc. U. S. Nat. Mus., vol. 51, No. 2162, pp. 487-524, 6 pls. (1917).

Dall, William Healey and Bartsch, Paul.

1904. Synopsis of the genera, subgenera and sections of the family Pyramidellidæ. Proc. Biol. Soc. Wash., vol. XVII, pp. 1-16.

1909. A monograph of West American Pyramidellid mollusks. Bull. U. S. Nat. Mus., No. 68, 258 pp., 30 pls.

Dall, W. H. Under Guppy, R. J. L. and Dall, W. H., 1896.

Dautzenberg, Philippe.

1917. A propos de l' "Universal Conchologist" de Thomas Martyn. Jour. de Conchyl., vol. 63, 4th ser. t. XVII, pp. 148-152.

Dautzenberg, Ph. and Fischer, H.

1882-1886. Under Bucquoy E., Dautzenberg, Ph. and Dollfus, G. F.

1912. Mollusques provenant des Campagnes de l'Hirondelle et de la Princesse-Alice dans les Mers du Nord, Résultates des Campagnes Scientifiques accomplies sur son Yacht par Albert ler Prince Souverain de Monaco. Fasc. 37, 630 pp. 11 pls., Manaco.

Davies, A. Morley.

1935. Tertiary Faunas. vol. I. The composition of Tertiary Faunas. 406 pp., 565 figs.

Deshayes, Gérard Paul.

1824-37. Descriptions des Coquilles Fossiles des Environs de Paris 2 vols. Text and Atlas. vol. 1. Conchifères. vol. 2. Gastéropodes. Paris. Issued in 46 livraisons, now bound together, the date must be taken according to the page. For correct date of parts see Newton, R. B., p. 309, 1891.

1856-1866. Description des Animaux sans Vertèbres découverts dans le bassin de Paris pour servir de Supplément à la Description des Coquilles Fossiles des environs de Paris, comprenant une revue générale de toutes les espèces actuellement connues. 3 vols. text, 2 vol. atlas. T. 1. Mollusques Acéphalés Dimyaires. T. 2. Mollusques Acéphalés Monomyaires et Brachiopodes. Mollusques céphalés. Pt. I. T. 3. Mollusques céphalés, Pt. II. Mollusques cephalopodes. Issued in 50 livraisons. For dates according to page see p. 668 of tome 3 or Newton, R. B., 1891, pp. 309-310.

Deshayes, G. P. and Milne-Edwards, H.

1835-1845. Histoire naturelle des Animaux sans Vetèbres. Lamarck. 2d ed. Histoire des Mollusques etc. vol. 6, 600 pp.; vol. 7, 735 pp. 1836; vol. 8, 660 pp., 1838; vol. 9, 728 pp., 1843; vol. 10, 1844; vol. 11, 1845. Paris.

Dollfus, Gustave F.
1882-1886. Under Bucquoy, E., Dautzenberg, Ph. and Dollfus, G. F.
1926. Critique de la classification des Turritelles. Bull. Soc. Géol. de France, 4th ser. t. 26, fasc. 1-2, pp. 27-32.

Duméril, A. M. Constant.
1806. Zoologue Analytique, ou Methode Naturelle de Classification des Animaux, rendue plus facile à l'aide de tableaux synoptiques; Paris. 1806. See Iredale, T., 1916, pp. 79-84.

Dunker, Wilhelm.
1847. Ueber neue Versteinerungen aus verschiedenen Gebirgsformationen. Palæontographica. I Bd., 3 lief., pp. 128-133, pl. XVIII.

Durham, J. Wyatt.
1937. Gastropods of the Family Epitoniidae from Mesozoic and Cenozoic Rocks of the West Coast of North America, Including one new species by F. E. Turner and one by R. A. Bramkamp. Jour. Paleontology vol. 11, No. 6, pp. 479-512, 2 pls.

Edwards, Frederic E.
1849. Monograph of the Eocene Mollusca, or descriptions of shells from the older Tertiaries of England. Pt. 1. Cephalopoda. 56 pp., 9 pls.
1852. Ibid. Pt. 2. Pulmonata. pp. 57-122, pls. X- XV.
1854-1860. Ibid. Pt. 3. Prosobranchiata. pp. 123-330, pls. XXVIII-XXXIII. For page dates see Newton, R. B., 1891, p. 310.

Findley, H. J.
1926. A further commentary on New Zealand molluscan systematics. Trans. New Zealand Institute, vol. 57, pp. 320-485, pls. 18-22.

Fischer, G. [de Waldheim].
1807. Classe des Mollusques. Mollusca et Testacea Linnaei. Muséum-Demidoff, vol. 3. Moscow.

Fischer, H.
1912. Under Dautzenberg, Ph. and Fischer, H.

Fischer, Paul.
1867. Description d'une espèce nouvelle des iles Chusan. Jour. de Conchyl., vol. XV, 3 ser. t. VII, pp. 304-305.
1880-1887. Manuel de Conchyliologie et de Paléontologie Conchyliologue ou Histoire Naturelle des Mollusques vivants et Fossiles suivi d'un appendice sur les Brachiopodes par D. P. Œhlert, avec 23 planches contenant 600 figures dessinées par S. P. Woodward. 1369, pp., text figures, 23 pls. Paris. For dates according to pages see page before title page or Newton. R. B., 1891, p. 311.
1857. Etudes sur un groupe de coquille de la famille des Trochidæ. Jour. de Conchyl., vol. VI, 2d ser. t. II, pp. 42-53.
1885. Bayle MS. names in Man. de Conch., see date according to page.

Fleming, John.
1817. Conchology. Brewster's Edinburgh Encyclopædia, vol. VII.
1828. A History of British Animals, 565 pp.

Forbes, Edward and Hanley, Sylvanus.
1848-1853. A History of British Mollusca and their Shells. vol. I. Lamellibranchs. 477 pp. 34 pls. 1848; vol. II. Lamellibranchs, Gastropods. (+) 557 pp., pls. (+) 35-79, lacking 75, 76, 1850; vol. III. Gastropods. 616 pp. pls. (+) 75, 76, 80—104d, 1851; vol. IV. Pulmonifera and cephalopoda. 301 pp., (+) 104e—133, 1853. See Reynell, A. for dates

Gabb, William More.
1860. Descriptions of new species of American Tertiary and Cretaceous fossils. Jour. Acad. Nat. Sci. Phila., 2d ser. vol. IV, pp. 375-406, pls. LXVII—LXIX.
1864. Description of the Cretaceous fossils. Pal. California, vol. 1 sect. 4, pp. 57-243. For dates of this and 1869 see Stewart, R. B., 1926, p. 310.
1866. Tertiary Invertebrate fossils. Pal. Calif., vol. 2, sect. 1, Pt. 1, February, pp. 1-38.
1868. An attempt at a revision of the two families Strombidæ and Aporrhaidæ. Amer. Jour. Conch., vol. IV, pp. 137-148, 2 pls.
1869. Tertiary Invertebrate fossils (cont'd), sect. 2. Pts. 2, 3, pp. 39-124; sect. 2, pts. 1, 2 pp. 125-254.
1873. Notes on the Topography and Geology of Santo Domingo. Trans. Amer. Philos. Soc. vol. XV, pp. 49-259; Description of some new genera of Mollusca. Proc. Acad. Nat. Sci. Phila., for 1872, vol. pp. 270-274, pls. 9-11.

Gale, Hoyt Rodney. Under Grant, U. S. IV.

Grant, Ulysses S. IV and Gale, Hoyt Rodney.
1931. Catalogue of the Marine Pliocene and Pleistocene mollusca of California and adjacent regions . . . San Diego Society of Natural History, memoir vol. I, 1036 pp. 32 pls.

Gardner, Julia.
1927. New species of mollusks from the Eocene of Texas. Jour. Wash. Acad. Sci., vol. 17, No. 14, pp. 362-383, 4 pls.
1935. The Midway Group of Texas including a chapter on the coral fauna by T. Wayland Vaughan and Willis Parkison Popenoe. Univ. Texas Bull. No. 3301, 403 pp., 28 pls.
1936. Relationships of Tertiary Ficidæ and Cassididæ of the Western Gulf of Mexico. [Abstract], Preliminary list of Titles and Abstracts of Papers to be offered at the Forty-Ninth Annual Meeting, Geological Society of America, p. 16, 1936.

Gmelin, J. F.
1789-90. Linnæus's Systema Naturæ. Ed. 13, vol. 6.

Grabau, Amadeus W.
1901. Under Johnson, C. W. and Grabau, A. W.
1903. Studies of Gastropoda. II. Fulgur and Sycotypus. The American Naturalist, vol. XXXVII, No. 440, pp. 515-539, text figs.
1904. Phylogeny of Fusus and its allies. Smith. Misc. Coll., vol. XLIV, No. 1417, 192 pp., XVII pls.

Gray, John E.
1821. A Natural Arrangement of Mollusca, according to their internal Structure. London Medical Repository, vol. 15, pp. 229-239.
1834. Alphabetical list of the Figures of Mollusca in "Griffith's Cuvier" (which see). pp. 595-601.
1839. The Zoology of Captain Beechey's Voyage; . . . during a voyage to the Pacific and Behreng's straits performed in his Majesty's Ship Blossom, etc., Molluscous Animals and their Shells, pp. 103-155, pls. 33-44.
1842. Synopsis of the Contents of the British Museum [Mollusca] 44th ed. For analysis see Iredale, T. 1913.
1847. A List of the Genera of Recent Mollusca, their Synonyma and Types. Proc. Zool. Soc. Lond. pt. XV, pp. 129-219.
1847. Leach in. See under Leach, W. E.

Gregorio, Antoine de.
1891. Iconografia Conchiologica Mediterranea vivente e Terziaria II. Studi sui generi Fissurella, Emarginula, Rimula. Annales de Géologie Paléontologie. 9 liv. April, pp. 1-11, pls. I-III.

Griffiths, Edward and Pidgeon, Edward.
1834. Mollusca and Radiata. Arranged by the Baron Cuvier with supplementary additions to each order. 601 pp., 43 pls. London.

Guettard, J. Et.
1770. Qui renferme la Concordance des Auteurs qui ont parlé des Tuyaux Marine fossiles, auxquels on a comparé ceux qui se pêchant actuellement dans la mer. [2d memoir]. Mem. sur differentes parties des sciences et arts, vol. III, p. 18.

Guillaume, Louis.
1924. Essais sur la Classification des Turritelles, ainsi que sur leur évolution et leurs migrations, depuis le début des temps Tertiaires. Société Géologique de France, Bull. 4th ser. Tome 14, fasc. 5, pp. 281-311, 2 pls.
1926. Résponse à la note de M. G. F. Dollfus: "Critique de la classification des Turritelles." Bull. Géol. Soc. France, 4th ser. t. XXVI, fasc. 6-8, pp. 425-428.

Guppy, Robert John Lechmere.
1873. On some new Tertiary fossils from Jamaica. Proc. Sci. Assoc. Trinidad, vol. 2, pp. 72-88 in Harris reprint, Bull. Amer. Pal. vol. VIII, No. 35, pp. 204-220. See under Harris, G. D.

Guppy, R. J. Lechmere and Dall, Wm. H.
1896. Descriptions of Tertiary fossils from the Antillean region. Proc. U. S. Nat. Mus. vol. 19, No. 1110, pp. 303-331, 4 pls. 1897. [New species described by one or the other not by both].

Hanley, Sylvanus.
1850-1853. Under Forbes, E. and Hanley, S.

Harris, Gilbert Dennison.
1892. The Tertiary Geology of Southern Arkansas. Annual report of the Geological Survey of Arkansas for 1892. vol. II, 207 pp., VII pls.
1895. New and otherwise interesting Tertiary Mollusca from Texas. Acad. Nat. Sci. Phila., Proc. vol. 47, pp. 45-88, IX pls.
1896. The Midway Stage. Bull. Amer. Pal., vol. I, No. 4, 156 pp., 15 pls.
1896. New and otherwise interesting Eocene Mollusca from the Gulf States. Proc. Acad. Nat. Sci. Phila., Proc. vol. 48, pp. 470-482, pls. XVIII-XXIII.
1897. The Lignitic Stage Pt. I. Stratigraphy and Pelecypoda. Bull. Amer. Pal., vol. II, No. 9, 102 pp., 14 pls.
1899. The Lignitic Stage. Pt. II. Scaphopoda, Gastropoda, Pteropoda and Cephalopoda. Bull. Amer. Pal., vol. III., No. 11, 128 pp., 12 pls.
1916. Horizon of the Shark River (N. J.) Eocene deposits. Science, n. s. vol. XLIII, No. 1111, pp. 532-534.
1919. Pelecypoda of the St. Maurice and Claiborne stages. Bull. Amer. Pal., vol. VI, No. 31, 268 pp., 59 pls.
1921. A Reprint of the more inaccessible paleontological writings of Robert John Lechmere Guppy. Bull. Amer. Pal., vol. VIII, No. 35, 198 pp. pls.

Harris, G. D. with Van Winkle, Katherine. See under.
1919. New or otherwise interesting Tertiary molluscan species from the East Coast of America. Pt. II. A few mid-upper Eocene fos-

sils from the Carolinas and Texas. Bull. Amer. Pal., vol. VIII, No. 33, pp. 12-18, pl. 2.

Harris, George F.
1897. Catalogue of Tertiary Mollusca in the Department of Geology British Museum (Natural History). Pt. I. The Australian Tertiary Mollusca. 407 pp., VIII pls.

Harris. George F. and Burrows, Henry W.
1891. The Eocene and Oligocene Beds of the Paris Basin. Geologist Association. 129 pp. London.

Harmer, F. W.
1914. The Pliocene Mollusca of Great Britain being supplimentary to S. V. Wood's monograph of the Crag Mollusca. Pt. I, Pal. Soc., vol. LXVII, 200 pp., XXIV pls.
1915. Ibid. Pt. II, pp. 201 302, pls. XXV - XXXII. Pal. Soc. vol. LXVIII, issued for 1914.
1918. Ibid. Pt. III, pp. 303-461, pls. XXXIII - XLIV, Pal. Soc., vol. LXX, issued for 1916
1920. Ibid. vol. II, pp. 485-652, pls. XLV - LII, Pal. Soc., vol. LXXII, issued for 1918.
1921. Ibid. vol. II, Pt. II, pp. 653-704, pls. LIII - LVI, Pal. Soc., vol. LXXIII issued for 1919.
1923. Ibid. vol. II, Pt. III, pp. 705-856, pls. LVII-LXIV, Pal. Soc., vol. LXXV issued 1921.
1925. Ibid. vol. II, No. IV, pp. 857-900, pl. LXV, Pal. Soc., vol. LXXVI issued 1922.

Hedley, Charles.
1924. Some Naticoids from Queensland. Rec. Aust. Museum, vol. 14, No. 3, pp. 154-162, 1 pl.

Heilprin, Angelo.
1879. On some new Eocene fossils from the Claiborne marine formation of Alabama. Acad. Nat. Sci. Phila., Proc. vol. 31, pp. 211-216, pl. XIII.
1880. On some new species of Eocene Mollusca from the southern United States. Proc. U. S. Nat. Mus., vol. III, pp. 149-152, 1 pl., 1880=Smith. Misc. Coll., vol. XXII, pp. 149-152, 1 pl., 1882.
1884. Contributions to the Tertairy Geology and Paleontology of the United States. 117 pp. map. Philadelphia.

Henderson, John B.
1920. A monograph of the East American Scaphopod Mollusks. U. S. Nat. Mus., Bull. 111, 177 pp., 20 pls.

Henderson, Junius.
1935. Fossil non-Marine Mollusca of North America. Geol. Soc. Amer. Special Pap. No. 3, 313 pp.

Hermannsen, A. N.
1846-49. Indicis generum Malacozoorum primordia. 2 vols. vol. 1, 637 pp., 1846; vol. 2, XXIX-XLII + 717 pp., 1849. Cassell.
1852. Supplementa et Corrigenda, 140 pp.

Hoernes, Moriz.
1856. Die Fossilen Mollusken des Tertiær- Beckens von Wien unter der mitwirkung von Paul Partsch. Bd. I. Univalen. Abhandlungen de Kaiserlich- Koniglichen Geologischen Reichsanstalt, Bd. III, 736 pp., 52 pls. Wien.

Hovey, E. O. Under Whitfield, R. and Hovey, E. O.

[Hughes], Beatrice Bolten. Under Bolten, Beatrice.

Iredale, Tom.

1910. Some notes on Pyramidellid nomenclature. The Nautilus, vol. XXIV, No. 5, pp. 52-58. (Discusses the point brought up. p 78 footnote this report, in regard to Eulimella).
1911. On some misapplied molluscan generic names. Proc. Mal. Soc. London, vol. 9, pp. 253-263.
1912. New generic names and new species of marine mollusca. Proc. Mal. Soc. London, vol. 10, pp. 217-228, pl. IX.
1913. A collation of the molluscan parts of the Synopsis of the Contents of the British Museum, 1838-1845. Proc. Mal. Soc. London, vol. 10, pp. 294-309.
1914. On some invalid molluscan generic names. Proc. Mal. Soc. London, vol. 11, pp. 170-178.
1914. Some more misused molluscan generic names. Proc. Mal. Soc. London, vol. 11, pp. 291-306.
1915. Notes on the names of some British marine mollusca. Proc. Mal. Soc. London, vol. 11, pp. 329-342.
1916. On two editions of Dumeril's Zoologie Analytique. Proc. Mal. Soc. London, vol. 12, pp. 79-84.
1916. Solander as a Conchologist. Proc. Mal. Soc. London, vol. 12, pp. 85-93.
1918. Molluscan nomenclatural problems and solutions. No. 1. Proc. Mal. Soc. London, vol. 3, pp. 28-40.

Ihering, Hermann von.
1909. Les Mélaniidés Américains. Jour. de Conchyl., t. LVII, 4th ser. t. XI, pp. 289-316.

Jeffreys, John Gwyn
1862-69. British Conchology or an account of the mollusca which now inhabit the British Isles and the surrounding seas. 5 vols.
1867. Fourth report on Dredging among the Shetland Isles. Ann. Mag. Nat. Hist., 3d ser. vol. XX, pp. 247-255.
1882-1885. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868-70. Proc. Zool. Soc. London, pt. V. Solenoconchia and Gastropoda, pp. 656-687, 2 pls. 1882; pt. VI, Gastropoda, pp. 88-115, 2 pls., 1883; pt. VIII, pp. 111-149, 2 pls., 1884; pt. VIII, pp. 341-372, 3 pls., 1884; pt. IX, pp. 27-63, 3 pls., 1885.

Johnson, Charles W.
1899. New and interesting species in the "Isaac Lea Collection of Eocene Mollusca". Acad. Nat. Sci. Phila., Proc., vol. 51, pp. 71-81, 2 pls.
1934. List of marine mollusca of the Atlantic Coast from Labrador to Texas. Proc. Boston Soc. Nat. Hist., vol. 40, No. 1, 203 pp.

Johnson, C. W. with Pilsbry, H. A.
1892. Under Pilsbry, H. A. and Johnson, C. W.

Johnson, Lawrence C. under Smith, E. A., Johnson, L C., and Langdon, D. W. Jr.

Jousseaume, Felix.
1875. Coquilles de la Famille des Marginelles: Monographie. Revue et Magasin de Zoologie pure et Appliquée, 3d ser. T. 3, pp. 164-271, 429-435, pls. 7, 8.
1879. Etude des Purpuridæ et description d'espèces nouvelles. Revue et Magasin de Zool. 3d ser. t. 7, pp. 314-348.
1880. Division Méthodique de la Famille des Purpurides. Le Naturaliste, No. 41, Dec., pp. 335-336. Includes some Bayle MS. names.

Kellum, Lewis B.

1926. Paleontology and stratigraphy of the Castle Hayne and Trent marls in North Carolina. U. S. Geol. Sur. Prof. Paper, No. 143, 56 pp., 11 pls.

Kennard, A. S., Salisbury, A. E. and Woodward, B. B.

1931. The Types of Lamarck's genera of shells as selected by J. G. Children in 1823. Smith. Misc. Coll., vol. 82, No. 17, pub. 3112, 39 pp.

Koenen, A. von.

1867. Das marine Mittel-Oligocän Nord-Deutschlands und seine Mollusken-Fauna. Palaeontigraphica, Bd. 16, pp. 53-127, pls. I, II (VI, VII).

Lamarck, Jean Baptiste Pierre Antoine de Monet de.

1799. Prodrome d'une nouvelle classification des Coquilles, Comprenant une rédaction appropriée des caractères génériques, et l'ètablissement d'un grand nombre de genre nouveaux. Société d'histoire naturelle de Paris. Mém. pp. 63-85.

1801. Systeme des Animaux sans Vertebres ou Tableau général des classes, des ordres et des genres de ces animaux; . . . . 432 pp., Paris.

1822. Histoire Naturalle des Animaux sans Vertèbres . . . . vol. 7, 711 pp. 7 vols. in all, 1818-1822. Ed. 2 see under Deshayes, G. P. and Milne-Edwards, H.

Lamy, Ed.

1921. Liste des publications scientifiques d'E. de Boury. Jour. de Conchyl., vol. 66, 4th ser. t. XX, pp. 76-79.

Langdon, Daniel W. Jr.

1886. Observations on the Tertiary of Mississippi and Alabama, with descriptions of new species. Amer. Jour. Sci., vol. 131, 3d ser. 31, No. 183, pp. 202-209.

Langdon, Daniel Jr. under Smith, E. A., Johnson, L. C. and Langdon, D. W. Jr.

Lea, Henry C.

1841. Description of some new species of fossil shells from the Eocene, at Claiborne, Alabama. Amer. Jour. Sci. Arts, vol. XL, No. I, pp. 92-103, 1 pl.

Leach, W. E.

1847. In Gray, J. E., The Classification of the British Mollusca by W. E. Leach, 1818. Annales and Magazine of Natural History, vol. XX, pp. 267-273.

1826. MS. names in Risso, A. See under.

Link, Heinrich Freidrich.

1806-1807. Beschriebung der Naturalien-Sammlung der Universität zu Rostock. Pt. 1, 1806; Pts. 2-4, 160+23 pp., 1807; Pt. 6, 37 pp., 1808; Mollusca Pt. 2, 1807. Facsimile Reproduction of the pages relating to Mollusca, collaborators J. R. le B. Tomlin and R. Winckworth. London. 1931. See Index under.

Linné Caroli a [Linnaeus].

1758. Systema Naturæ. Regnum Animale. Lipsiæ. 10 ed.

Lovén, S.

1846. Index Molluscorum litora Scandinaviæ occidentalia habitantium. Cfv. K. Vet.-Akad. Forh. (1847).

Lowe, R. T.
1827. On Balanus punctatus, Puncturella Flemingii, etc.; together with some corrections relative to Turbo carneus, and some of the Chitons before described. The Zoological Journal, vol. III, pp. 76-80.

Lowe, H. N. under Pilsbry, H. A. and Lowe, H. N.

Lyell, Charles.
1845. Observations on the White Limestone and other Eocene or older Tertiary Formations of Virginia, South Carolina, and Georgia. Quart. Jour. Geol. Soc. London, vol. 1, pp. 429-442 text figs.

Martin, Karl.
1914. Die Fauna des Obereocäns von Nunggulan auf Java. Sammlungen des Geologischen Reichs-Museums in Leiden, Bd. II, Heft IV, pp. 107-222, 8 pls. Cossmann co-author of some of new names published in but not co-author of report as given on p. 123, footnote 198, this paper.

Martin, George Curtis. Under Clark, W. B and Martin, G. C.

Martini, F. H. W. and Chemnitz, Johann Hieronymus.
1769-1795. Neues systematisches Conchylien-Cabinet etc. vol. I-XI, vols. 1-3, 1769-1777 by Martini; vols. 4-11, 1780-1795 by Chemnitz. vols. 1-5, Univalves; vols. 6-11, Bivalves and Supplement. For dates of vols. see Newton, R. B., 1891, p. 316. The series continued 1838-1920 by numerous writers with 78 Abt., 106 Teilen.

Martyn, Thomas.
1784. The Universal Conchologist. Vol. I, 40 pls., 1784; vol. II, 40 pls., 1784; vol. III, 40 plates, 1786; vol. IV, 40 pls., 1787. For details and verification of dates of the various copies and discussion of the complicated history of this rare and beautiful work see Dall, W. H., 1906, 1908.

Maury, Carlotta Joaquina.
1909. A new connecting link in the genesis of Fulgur. Amer. Jour. Sci. 177, 4th ser. vol. 27, No. 160, p. 335, text fig.
1912. A contribution to the Paleontology of Trinidad. Acad. Nat. Sci. Phila., Jour. 2d ser. vol. XV, pp. 25-112, 9 pls.

McMasters, John H. under Schenk, Edward T. and McMasters, John H.

Meek, F. B.
1876. A report on the Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country. Rep. U. S. Geol. Surv. Terr., vol. 9, LXIV+629 pp., 45 pls.

Melvill, J. Cosmo.
1906. A revision of the species of Cyclostrematidæ and Liotiidæ occurring in the Persian Gulf and North Arabian Sea. Proc. Mal. Soc. London, vol. 7, pp. 20-28, pl. III.

Meyer, Otto.
1884. Notes on Tertiary shells. Acad. Nat. Sci. Phila., Proc. vol. 36, pp. 104-112, text figs.
1885. The genealogy and the age of the species of the southern Old-tertiary. Amer. Jour. Sci., CXXIX, 3d ser. vol XXIX, No. 174, pp. 457-468.
1886. Contributions to the Eocene paleontology of Alabama and Mississippi. Geol. Sur. Ala., Bull. No. 1, pt. II, pp. 63-85, 3 pls.
1887. Beitrag zur Kenntnis der fauna des Alttertiärs von Mississippi und Alabama. Bericht über die Senckenbergische Gesellschaft in Frankfurt a.M., 1886., 22 pp., 2 pls.

1887. On inverterbrates from the Eocene of Mississippi and Alabama. Acad. Nat. Sci. Phila., Proc. vol. 39, pp. 51-56, pl. III.

Meyer, Otto and Aldrich, Truman Hemingway.
1886. The Tertiary fauna of Newton and Wautubbee, Miss. Cincinnati Soc. Nat. Hist., Jour. vol. IX, No. 2, pp. 40-64, pl. 2.

Montagu, George.
1803-1808. Testacea Britannica, or Natural History of British Shells, Marine, Land and Freshwater. 2 vols. London.

Montfort, Pierre Denys de.
1808-1810. Conchyliologie Systématique et Classification Méthodique des Coquilles; offrant leurs figures, leur arrangement générique, leurs descriptions caractéristiques, leurs noms; ainsi que leur synonymie en plusieurs langues. Tome I. Coquilles Univalves, Cloisonćes, 409 pp. figures, 1808; Coquilles Univalves, non cloisonnées. Tome 2, 1810.

Montersato, T. Allery Marchese di.
1883-1884. Conchiglie Littorali Mediterranee. Il Naturalista Siciliano, vol. 3, pp. 87, 102, 137, 159, 227, 277.
1884. Nomenclatura generica e specifica di alcune Conchiglie Mediteranee, Palermo, pp. 1-152.
1913. Note on the genus Pseudomalaxis, Fischer, and Descriptions of a new species and subgenus. Proc. Mal. Soc. London, vol. 10, pp. 362-363, text figs.

Moquin-Tandon, Alfred.
1885. Histoire Naturalle des Mollusques Terrestres et Fluviatiles de France. 2 vols. Paris.

Mörch, Otto Andreas Lowson.
1852., 1853. Catalogus Conchyliorum quæ reliquit D. Alphonso d'Aguirra & Gadea Comes de Yoldi, regis daniæ cubiculariorum princeps, ordinis dannebrogici in prima classe & ordinis caroli tertii eques. Fasc. I. Cephalophora. 170 pp. Fasc. II. Acephala. Annulata Cirripedia. Echinodermata. 1853. 74 pp.
1857. Mollusca Grönlandica pp. 75-100, in Grönland geographisk og statistick beskrevet by H. Rink. Andet Bind.
1858. Note sur le genre Volutharpa Fischer. Jour. de Conchyl. 2d ser. tome III, pp. 40-44.
1860. Review of the genus Tenagodus, Guettard, Proc. Zool. Soc. London, pp. 400-415.
1860-1862. Review of the Vermetidæ. Proc. Zool. Soc. London, pp. 145-181, 1 pl., 1861; ibid, pp. 326-365, 1861; ibid, pp. 54-83, 1862.
1875. Synopsis Molluscorum marinorum Indiarum occidentallium. Malak. Blätter für 1874, 1875, vol. 22.

Müller, Othone Friderico.
1774. Vermium Terrestrium et Fulviatilium seu animalium infusoriorum, helminithicorum, et testaceorum, non marinorum, Succincta Historia. vol. 2. Hafniæ et Lipsiæ.
1776. Zoologigiæ Danicæ Prodromus seu Animalium Daniæ et Norvegiæ Indigenarum Characters, Nomina et Synonyma Imprimis popularium, 282 pp. Copenhagen.

Nevill, Geoffrey.
1884. Hand List of Mollusca in the Indian Museum, Calcutta. Bt. II, Gastropoda. Prosobranchia- Neurobranchia (cont'd), 306 pp.

Newton, Richard Bullen.
1891. Systematic list of the Frederick E. Edwards collection of British Oligocene and Eocene Mollusca in the British Museum (Natural

History) etc. 365 pp. London. Excellent bibliography for dates of rare publications.
1906. Note on Swainson's genus Volutilithes. Proc. Mal. Soc. London, vol. 7, pp. 100-104, pl. XII.
1922. Eocene Mollusca from Nigeria. Geol. Sur. Nigeria. Bull. 3, pp. 140, 11 pls.

Newton, Richard Bullen and Harris, George.
1894. A Revision of the British Eocene Cephalopoda. Proc. Mal. Soc. London, vol. i, pp. 119-131, pl. X, text figs.

d'Orbigny, Alcide.
1835-1843. Voyage dans l'Amerique Meridionale, etc. tome 5, Mollusques, 758 pp., 85 pls. 1835-43. [Newton, 1891, p. 318 gives 1839-40].
1842. Mémoire sur deux genres nouveaux de Céphalopodes fossiles (les Conoteuthis et Spirulirostra) offrant des passages, d'un côté entre la Spirule et la Sèche, de l'autre entre les Belemnites et les Ommastrèphes. Ann. Sci. Nat. 2d ser. t. XVII (Zoologie), pp. 362-379, 2 pls.

Oldroyd, Ida.
1927. The marine shells of the West Coast of North America. Scaphopods and Gastropods. vol. II, pt. I, 297 pp., 29 pls. Pt. II, 304 pp., pls. 30-72. Pt. III, 339, pp., pls. 73-108.

Olsson, Axel A.
1928. Contributions to the Tertiary Paleontology of Northern Peru: Pt. I. Eocene Mollusca and Brachiopoda. Bull. Amer. Pal., vol. 14, No. 52, 154, pp., 26 pls.
1934. Contributions to the paleontology of Northern Peru: The Cretaceous of the Amotape Region. Bull. Amer. Pal., vol. 20, No. 69, 81 pp., 11 pls.

Oostingh. C. H.
1935. Die Mollusken des Pliozäns von Boemiajoe (Java), Wetenschappelijke Mededeeligen No. 26, 247 pp., 17 pls., 31 text figs.

Oppenheim, Paul.
1894. Die eocäne fauna des Mt. Pulli bei Valdagno im Vincentino. Zeitschrift Deutsch. Geol. Gesell. Bd. 46, Heft 2, pp. 309-445, 9 pls.

Owen, David Dale.
1860. Second report of a Geological Reconnoissance of the middle and southern counties of Arkansas made during the years 1859 and 1860. 433 pp., 3 pls. (mollusks).

Pace, S.
1902. Contributions to the Study of the Columbellidæ, Proc. Mal. Soc. Lond, vol. 5, pp. 36-154.

Palmer, Dorothy Kemper. Under **Clark, B. L. and Palmer, D. K.**

Palmer, Katherine VanWinkle. Under **Price, W. A and Palmer, K. V. W.**

Peyrot, A. Under **Cossmann, M. and Peyrot, A.**

Philippi, Rudolphus Amandus.
1836, 1844. Enumeratio Molluscorum Siciliæ cum viventium tum in tellure tertiaria fossilium, quæ in itinere suo observavit. vol. I, Berolini. 1836; vol. II, Halis Saxonum, 1844.

Pilsbry, Henry Augustus.
1889. Manual of Conchology; . . . . vol. XI. Trochidæ, Stomatiidæ, Pleurotomariidæ, Haliotidæ. (Cont'd the publication begun by George W. Tryon, Jr.). 519 pp., 67 pls.

1893. Manual of Conchology. . . . . vol. XV. Polyplacophora, Acanthochitidæ, Cryptoptacidæ and Appendix. Tectibranchiata. 436 pp. 61 pls.

1922. Revision of W. M. Gabb's Tertiary Mollusca of Santo Domingo. Acad. Nat. Sci. Phila., Proc. vol. 73, pt. II, pp. 305-433, pls. XVI-XLVII.

1929. Neverita recluziana (Desh.) and its allies. The Nautilus, vol. XLII, No. 4, pp. 109-113, 1 pl.

Pilsbry, Henry A. and Johnson, Charles W.

1892. Catalogue of Fissurellidæ of the United States. The Nautilus, vol. V, No. 9, January, pp. 102-107; Additional U. S. Fissurellidæ, The Nautilus, vol. V, No. 10, p. 113.

Pilsbry, Henry A. and Lowe, H. N.

1933. West Mexican and Central American Mollusks collected by H. N. Lowe. 1929-31. Acad. Nat. Sci. Phila., Proc. vol. LXXXIV, (1932), pp. 33-144, 17 pls.

Pilsbry, Henry A. and Sharp, B.

1897-1898. Manual of Conchology; . . . . vol. XVII, Scaphopoda, 348 pp., 48 pls.

Pissarro, G. Under **Cossmann, M. and Pissarro, G.**

Plummer, Frederick B. [With **Sellards, E. H., Adkins, W. S.**].

1933. Cenozoic Systems in Texas in The Geology of Texas, vol. I, Stratigraphy. pp. 519-818, pls. VII-X.

Price, W. Armstrong and Palmer, Katherine Van Winkle.

1928. A new fauna from the Cook Mountain Eocene near Smithville, Bastrop County, Texas. Jour. Paleontology, vol. 2, No. 1, pp. 20-31, pls. 6, 7.

Rafinesque-Schmaltz, Constantine Samuel.

1815. Analyse de la Nature. Palermo. For molluscan names correctly proposed in see Iredale, 1911, p. 262.

Reeve, Lovell Augustus.

1843-1878. Conchologia Iconica. 20 vols. London.

1848. On Fastigiella, a new genus of shells of the Lamarckian family Canalifera. Proc. Zool. Soc. London, pt. XVI, pp. 14-15.

1859. Conchologia Iconica. Monograph genus Pirena. 2 pls.

Rehder, Harald A.

1935. New Carribean marine shells. The Nautilus, vol. XLVIII, No. 4, pp. 127-130, pl. 7, April.

Renick, Brink Coleman and Stenzel, H. B.

1931. The lower Claiborne on the Brazos River, Texas. Univ. Texas Bull. No. 3101, pp. 73-108, pls. VI, VII.

Reynell, Alexander.

1918. On the dates of the parts of Forbes and Hanley's History of British Mollusca. Proc. Mal. Soc. London, vol. 13, pp. 25-26.

Roeding, Peter Fried. Under **Bolten, Joa. Fried.**

1826. Histoire des Principales Productions de l'Europe Méridionale et particulièrement de celles des Environs de Nice et des Alpes Maritimes. 5 vols. Paris. Tome 4, Aperçu sur l'Histoire Naturelle des Mollusques qui vivent sur les bords de la Mediterranée boréale et des Coquilles terrestres, fluviatiles et marines, subfossiles, fossiles et petrifiées, qui gisent dans les diverses formations des Alpes Maritimes. W. E. Leach's MS. names included in. Indicated in Risso by footnote.

Roemer, Ferdinand.
1849. Texas . . . . XIV + 464 pp. map. Bonn.

Sacco, Federico
1890. I Molluschi dei terreni terziarii del Piemonte e della Liguria descritti da Luigi Bellardi. Pt. VI. Volutidae, Marginellidae, Columbellidae. 76 pp., 2 pls., Torino.
1890. Ibid. Pt. VII. Harpidae e Cassididae. 96 pp., 2 pls., Torino.
1890. Ibid. Pt. VII. Harpidae e Cassididae. Bollettino dei Musei di Zoologia ed Anatomia comparata della R. Università di Torino. vol. V, N. 83. 20 pp.
1890. Ibid. Pt. VIII. Galeodoliidae, Doliidae, Ficulidae, Naticidae. Bollettino dei musei di Zoologia ed Anatomia comparata della R. Università di Torino. vol. V, N. 86, pp. 21-43.
1891. Ibid. Pt. VIII, Galeodoliidae, Doliidae, Ficulidae e Naticidae. 114 pp. 2 pls., Torino.
1891. Ibid. Pt. IX. Naticidae (fine), Scalariidae e Aclidae. 103 pp., 2 pls., Torino.
1891. Ibid. Pt. X. Cassididae (aggiunte), Terebridae e Pusionellidae. 67 pp., 2 pls., Torino.
1892. Ibid. Pt. XI. Eulimidae e Pyramidellidae (parte). 100 pp., 2 pls., Torino.
1892. Ibid. Pt. XII. Pyramidellidae (fine), Ringiculidae, Solariidae e Scalariidae (aggiunte). 88 pp., 2 pls., Torino.
1893. Ibid. Pt. XIII. Conidae. fasc. I. 56 pp., 2 pls., Torino.
1893. Ibid. Pt. XIII. fasc. II. Conidae e Conorbidae. 143 pp., 9 pls., Torino.

Salisbury, A E. Under Kennard, A. S., Salisbury, A. E. and Woodward, B. B.

Sars, G. O.
1878. Bidrag til Kunds Kaben om Norges arktiske Fauna. I. Mollusca Regionis Arcticae Norvegiae. Oversigt over de I Norges Arktiske Region fore Kommende Blöddyr. 466 pp., 18 pls. Christinia.

Schenck, Hubert Gregory.
1926. Cassididæ of Western America. Univ. California Pub. Geology, vol. 16, No. 4, pp. 69-98, pls. 12-15, text fig.

Schenk, Edward T. and McMasters, John H.
1935. Procedure in Taxonomy. Including a reprint of the International Rules of Zoölogival Nomenclature with Summaries of Opinions Rendered to the present date. 72 pp. Stanford University, Cal.

Schilder, F. A
1922. Contributions to the knowledge of the genera Cypræa and Trivia. Proc. Mal. Soc. London vol. XV, pp. 98-122.
1924. Systematischer Index der rezenten Cypræidæ. Archiv. Naturg., 90, Abt. A, Heft 4, pp. 179-214.
1926. Additions and corrections to Vredenberg's Classification of the Cypræidæ. Records Geol. Sur. India, vol. LVIII, pt. 4, pp. 358-379.
1927. Revision der Cypraeacea. Archiv. Naturg., 91, Abt. A, Heft 10, pp. 1-165. (Date corrected, not 1925 as stated on title page, Schilder, 1929, p. 310).
1929. The Eocene Amphiperatidæ and Cypræidæ of England. Proc. Mal. Soc. Lond., vol. XX, p. 298-311.
1932. The Living Species of Amphiperatinæ. Proc. Mal. Soc. London, vol. XX, pp. 46-64.

1932. Fossilium Catalogus. I: Animalia. Pars 55; Cypraeacea, pp. 1-276. Ed. W. Quenstedt. Berlin.

1933. Monograph of the Subfamily Eratoinæ. Proc. Mal. Soc. London, vol. XX, pp. 244-282.

Schuchert, Charles. Assist. Dall, W. H., Stanton, T. W. and Bassler, R. S.

1905. Catalogue of the type specimens of fossil invertebrates in the department of Geology, United States National Museum. Bull. U. S. Nat. Mus., No. 53, Pt. I, Pt. Fossil Invertebrates. Sect. I, 704 pp.

Schumacher, Chretien Fréderic.

1817. Essais d'un Nouveau Systeme des Habitations des Vers Testaces. 287, pp., 22 pls. Copenhagen.

Scopoli, Joannes Ant.

1777. Introductio ad Historiam Naturalem sistens genera Lapidum, Plantarum et Animalium, etc., in tribus divisa, subinde ad leges naturæ. Pragæ.

Semper, O.

1865. Du genre Mathilda. Jour. de Conchyl., vol. XIII, 3d ser. t. V, pp. 328-345, pl. 13.

Sequenza, G.

1863. Annali del Accademia degli Aspiranti Naturalisti, Napoli, ser. 3, vol. 2, p. 83, 1862 (1863).

Sharp, B. Under Pilsbry, H. A. and Sharp, B.

Sherborn, C. Davies and Woodward, B. B.

1906. On the dates of publication of the natural history portions of the "Encyclopédie Méthodique." Ann. Mag. Nat. Hist., 7th ser. vol. XVII, pp. 577-582.

Simpson, Charles Torrey.

1900. Synopsis of the Naiades, or Pearly Fresh-water Mussels. Proc. U. S. Nat. Mus., vol. 22, No. 1205, pp. 501-1044. PP. 936-998 excellent conchological bibliography, authors' names complete.

Smith, Burnett.

1906. Phylogeny of the races of Volutilithes petrosus. Acad. Nat. Sci. Phila., Proc. vol. 58, pp. 52-76, 1 pl., text figs.

1907. A review of the American Volutidæ by Wm. H. Dall. The Nautilus, vol. XX, No. 11, pp. 129-131. March.

1907. A contribution to the morphology of Pyrula. Acad. Nat. Sci. Phila., Proc. vol. 59, pp. 208-219, 1 pl., text figs. May.

1907. A new species of Athleta and a note on the morphology of Athleta petrosa. Acad. Nat. Sci. Phila., Proc. vol. 59, pp. 230-242, text figs.

Smith, Edgar Albert.

1906. Note on the subgenus Malluvium, Mellvill. Proc. Mal. Soc. London, vol. 7, pp. 122, 123.

1915. On the genera Eglisia, Callostracum, Mesalia, Turritellopsis, and Trachyrhynchus. Ann. Mag. Nat. Hist., 8th ser. vol. 15, pp. 360-377, text figs.

Smith, Eugene A., Johnson, Lawrence C. and Langdon, Daniel W, Jr.

1894. Report on the geology of the coastal plain of Alabama. Bull. Geol. Sur. Ala. Report on fossils by T. H. Aldrich.

Solander. D. C.

1766. In Brander, Gustavo. See under.

Sowerby, James.

1812. The Mineral Conchology of Great Britain; or coloured figures and descriptions of those remains of testaceous animals or Shells,

 532

which have been preserved at various times and depths in the earth. vol. I, pls. 1-102, 234 pp. For complete notation by page and plate according to date of the 7 vols. of the complete work see Newton, 1891, p. 323. James Sowerby did 65 Nos., to 1822, subsequent work, to 1846 was completed by his son James de Carle Sowerby. London.

Sowerby, James de Carle.
1829. Same title as under James Sowerby. Vol. VI, 230 pp., 609 pls. London.

Sowerby, George Brettingham.
1820-1834. The Genera of Recent and Fossil Shells, for the use of students in Conchology and Geology. London. All not dated. For dates see Newton, 1891 p. 321.
1838. Description of a new genus of Trochidae, belonging to the family of Gasteropoda phytophaga. Mag. Nat. Hist., n. s. vol. II, pp. 96-97.

Speyer, Oscar.
1867. Die Conchylien der Casselar Tertiärbildungen, Palæontographica, 16 Bd. pp. 295-339, pls. 31-35.

Stanton, Timothy William.
tion. U. S. Geol. Sur. Prof. Paper 128A, 52 pp., 9 pls.
1920. The fauna of the Cannonball marine member of the Lance forma-

Stenzel, H. B. Under Renick, B. Coleman and Stenzel, H. B.

Stenzel, Henryk Bronislaw.
1936. A new formation in the Claiborne group. Univ. Texas, Bull. No. 3501, pp. 267-279.

Stephenson, Lloyd William. Under **Cooke, C. W. and Stephenson, L. W.**

Stewart, Ralph Bentley.
1926. Gabb's California fossil type Gastropods. Acad. Nat. Sci. Phila., Proc. vol. 78, pp. 287-447, pls. XX-XXXII.
1930. Gabb's California Cretaceous and Tertiary type Lamellibranchs. Acad. Nat. Sci. Phila., Special Pub. No. 3, 314 pp., 17 pls.

Stoliczka, Ferdinand.
1868. The Gastropoda of the Cretaceous rocks of Southern India. Vol. II, 204-498, pls. 17-28, 1868. Memoirs Geol. Surv. India. Palæontological Indica, V. 1-4, 203 pp., 16 pls. 1867.

Stimpson, William.
1865. On certain genera and families of Zoophagous Gasteropods. Amer. Jour. Conch., vol. I, pp. 55-64, 2 pls.

Sutur, Henry.
1913. Manual of New Zealand Mollusca with (1915) Atlas of Plates. 1120 pp.; Gov't. Printer. Wellington.

Swainson, William.
1829, 1831-33. Zoological Illustrations or Original Figures and Descriptions of new, rare or interesting Animals selected chiefly from the Classes of Ornithology, Entomology and Conchology, and arranged according to their natural affinities. 2d ser. vol. I, 45 pls. with description of each. 1829. Vol. II, 91 pls. with description of each, 1831-32. Vol. III, pls. and pp. 99-111, 1832-33.
1840. A Treatise on Malacology or Shells and Shell-fish, 419 pp. text figs.

Tate, Ralph.
1870. Appendix to the Manual of Mollusca of S. P. Woodward, A. L. S. etc. 86 pp. text figs. London.

Tegland, Nellie May.
1931. The Gastropod genus Galeodea in the Oligocene of Washington, Univ. Cal. Pub. Geol. (Bull. Dept. Geol. Sci.), vol. 19, No. 18, pp. 397-434, pls. 59-65.

Thiele, Johannes.
1929. Handbuch der Systematischen Weichtierkunde. Pt. I. Gastropoda through Terebra. 376 pp., 470 text figs. Pt. II. Gastropoda. 376-778 pp. 313 text figs. Pt. III. Scaphopoda. Bivalvia. pp. 779-1022, 110 text figs.

Tomlin, J R. le Brocton.
1931. On the name Mitra lineata. The Nautilus, vol. XLV, No. 2, pp. 53-55.

Tomlin, J. R. le B. and Winckworth, R.
1936. An Index to the species of mollusca in the Beschreibung of. H. F. Link. Proc. Mal. Soc. London, vol. XXII, pt. I, pp. 27-48.

Tryon, George Washington, Jr.
1882-1884. Structural and Systematic Conchology: and Introduction to the study of the Mollusca. vol. I, General 312 pp., 1882, Vol. 2. Cephalopoda, Pteropoda, Gastropoda, 430 pp., 1883. Vol. 3, Pulmonata, Scaphopoda, Pelecypoda, Molluscoida, 453 pp., 1884, 140 pls.
1879. Manual of Conchology. Vol. I Cephalopoda. 316 pp., 112 pls.
1880. Ibid. Vol. II. Muricinae, Purpurinae. 289 pp., 70 pls.
1882. Ibid. Vol. IV. Nassidae, Tubinellidae, Volutidae, Mitridæ, 276 pp., 58 pls.
1883. Ibid. Vol. V. Marginellidae, Olividae, Columbellidæ. 276 pp., 63 pls.
1884. Ibid. Vol. VI. Conidae, Pleurotomidae. 413 pp., 34 pls.
1885. Ibid. Vol. VII, Terebridae, Cancellariidae, Strombidae, Cypracidæ Doliidae. 309 pp., 10 pls.
1887. Ibid. Vol. IX. Solariidae, Ianthinidae, Trichotropidae, Scalariidae, Cerithiidae, Rissoidae, Littorinidae. 488 pp. 71 pls.

Tryon, George W. Jr. and Pilsbry, Henry A.
1888. Manual of Conchology. Vol. X. Neritidae, Adeorbiidae, Cyclostrematidae, Liotiidae. By Tryon. Phasianellidae, Turbinidæ Delphinulinae. By Pilsbry.
1890. Ibid. Vol. XII. Stomatellidae, Scissurellidae, Pleurotomariidae, Haliotidæ, Scutellinidae, Addisoniidae, Cocculinidae, Fissurellidae.

Tuomy, Michael.
1848. Report on the Geology of South Carolina. 293 pp.+ LVI pp.

VanWinkle, Katherine and Harris, Gilbert Dennison.
1919. New and otherwise interesting Tertiary molluscan species from the East Coast of America. Remarks on Virginia Eocene fossils. pp. 6-12, pl. 1; Remarks on some new species from Trinidad, pp. 19-27, pl. 3 by Van Winkle. Vol. VIII, No. 33.

[Palmer] VanWinkle, Katherine E. H.
1921. Illustrations and descriptions of fossil Mollusca contained in the Paleontological collections at Cornell University. Vol. VIII, No. 36, 12 pp., 1 pl.

Vaughan, Thomas Wayland.
1896. A brief contribution to the geology and paleontology of north-

western Louisiana. U. S. Geol. Sur., Bull. No. 142, 65 pp., 14 pls.

Verrill, Addison E.

1882. Catalogue of marine Mollusca added to the fauna of the New England Region, during the past ten years. Trans. Conn. Acad. Arts Sci., vol. V, pp. 447-587, pls. 42-44, 57-58.

1883. Second catalogue of Mollusca recently added to the fauna of the New England Coast and the adjacent parts of the Atlantic, consisting mostly of Deep Sea species, with notes on others previously recorded. A Conn. Acad. Arts. Sci. Trans., vol. VI, pp. 139-294, pls. 28-32.

1885. Third catalogue of Mollusca recently added to the fauna of New England, consisting mostly of Deep-Sea Species, with notes on others previously recorded. Conn. Acad. Arts Sci., Trans. vol. VI, pp. 395-452, pls. 42-44.

Voltz, M.

1830. Observations sur les Belemnites. Mem. Société d'Histoire Naturelle de Strasbourg, tome I, pp. 1-72, pls. I-VIII.

Vokes, H. E.

1936. Notes on Ancilla Lamarck. Proc. Pal. Soc. in Proc. Geol. Soc. Amer. for 1935, p. 414.

1937. The Gastropod genus Harpa in the Eocene of the western United States. Jour. Paleontology, vol. II, No. 1, pp. 10-12, pl. 2.

Vokes, H. E. under Clark, Bruce L and Vokes, H. E.

Watson, Robert Boog.

1883. Mollusca of H. M. S. 'Challenger' Expedition.- pt. XV. Jour. Linn. Soc. Zoology, vol. XVI, pp. 594-611.

1886. Report on the scientific results of the Voyage of H. M. S. Challenger during the years 1873-76. Zoology. Vol. XV. Report on the Scaphopoda and Gasteropoda collected by H. M. S. Challenger during the years 1873-76. pp. I-V + 756, LIII pls.

Wheeler, Harry Edgar.

1909. A week at Claiborne. The Nautilus, vol. XXII, No. 10, pp. 97-98.

1910. A new Claibornian shell. The Nautilus, vol. XXIV, No. 2, pp. 13-14; vol. XXIV, No. 7, pl. IV.

1935. Timothy Abbott Conrad, with particular reference to his work in Alabama one hundred years ago. Bull. Amer. Pal., vol. XXIII, No. 77, 157 pp., 27 pls.

Whitfield, Robert Parr.

1865. Descriptions of new species of Eocene fossils. Amer. Jour. Conch., vol. I, pp. 259-268, pl. 27.

1892. Gasteropoda and Cephalopoda of the Raritan Clays and Greensand Marls of New Jersey. Monograph U. S. Geol. Sur., vol. XVIII, 402 pp., L pls.

1899. List of fossils, types and figured specimens, used in the Pal+-ontological work of R. P. Whitfield, showing where they are probably to be found at the present time. Ann. New York Acad. Sci., vol. XII, No. 8, pp. 139-186.

1905. Notice of a new species of Fasciolaria from the Eocene green marls at Shark River, N. J. Bull. Amer. Mus. Nat. Hist. No. 21, pp. 301, 2 pls.

Whitfield, Robert Parr and Hovey, E. O.

1901. Catalogue of the types and figured specimens in the Palæontological collection of the Geological Department American Museum of Natural History. Bull. Amer. Mus. Nat. Hist., vol. XI, pt. IV, pp. 358-500.

Winckworth, R. Under Tomlin, J. R. le B. and Winckworth, R.

Wood, Elvira.
1910. The phylogeny of certain Cerithiidæ. Ann. New York Acad. Sci., vol. XX, No. 1, pt. 1, pp. 92, 9 pls., text figs.

Wood, Searles Valentine.
1842. A catalogue of shells from the Crag. [Gastropods]. Ann. Mag. Nat. Hist. vol. IX, pp. 455-462; pp. 527-544, 1 pl.
1848. Monograph of the Crag Mollusca with description of shells from the upper Tertiaries of the British Isles. Vol. I. Univalves. Pal. Society, 208 pp. 21 pls.
1872. Supplement to the Crag Mollusca comprising Testacea from the upper Tertiaries of the east of England. Pt. I. Univalves. XXXI pp. 99 pp. VII pls. Pal. Soc., vol. XXV for 1871.
1879. Second Supplement to the Crag Mollusca comprising Testacea from the upper Tertiaries of the East of England. Univalves and Bivalves. II pp. 58 pp., VI pls., Pal. Soc. vol. XXXIII, for 1879.

Woodring, Wendell Phillips.
1928. Miocene Mollusks from Bowden, Jamaica. Pt. II. Gastropods and discussion of results. Contributions to the Geology and Paleontology of the West Indies. Carnegie Inst. Wash., Pub. No. 385, 564 pp,, 40 pls.

Woodward, Samuel P.
1871. A Manual of the Mollusca being a treatise on Recent and fossil Shells. 2d ed. with appendix by Tate, Ralph which see. 518 pp., pp., 23 pls. (Woodward only). London.

Woodward, B. B. Under Kennard, A. S., Salisbury, A. E and Woodward, B. B.

Wrigley, Arthur.
1929. Notes on English Eocene Mollusca, with Descriptions of New Species. Proc. Mal. Soc. London, vol. XVIII, pt. V. pp. 235-251, 2 pls.
1930. Notes on English Eocene and Oligocene Mollusca with descriptions of new species. IV, Muricidæ. Proc. Mal. Soc. London., vol. XIX, pt. III, pp. 91-115, 2 pls.
1932. English Eocene species of Sassia, with a note on the morphology of the Cymatiidæ and the Bursidæ. Proc. Mal. Soc. London, vol. XX, pt. II, pp. 127-140, 2 pls.
1934. English and Oligocene Cassididæ, with notes on the nomenclature and morphology of the family, Proc. Mal. Soc. London, vol. XXI, pt. II, pp. 108-130, pls. 15-17.
1935. English Eocene and Oligocene Cancellariidæ. Proc. Mal. Soc. London, vol. XXI, pt. VI, pp. 356-380, 3 pls.

INDEX, VOLUME VII

INDEX TO VOLUME VII

Note: Light face figures refer to the page. Heavy face figures refer to the plate numbers.

D

End of Part I

ERRATA

PAGE	LINE	
7	1	Read "Heckscher" for "Hecksher".
11	45	Loc. 798, add "Oligocene".
12		Footnote 20 "(Entalis . .) place under Subgenus **Antalis.**
24	21	Add "plate 2, fig. 26".
27	23	Belongs with footnote 38.
38	25	Add "fig. 6".
48		Footnote 75, read "1883" for "1833".
53	16	Read "**exacuus**" for "**exacuum**".
56	10	Read "**eboreus**" for "**eborea**". Footnote 99 "(Platychilus..)" place under "Genus **Tiburnus**..."
71	24	Read "Genotype by subsequent designation...".
73	12	Read "12-15" for "12, 15".
74	2	Delete "(Lea)" before Cossmann.
77	4	Read "**pseudopygmæus**".
78	1	Add "No. 2716" to paratypes.
81		Footnote 130, "Eulimella tenua..." place in synonymy **Turbonilla sabina**, n. sp.
83	40	Add "figs. 7, 9" to plate 79.
86		Footnote 143, read "In Guppy, R.J.L. and Dall, W. H..1896".
92	11	Add loc. "766" under "Occurrence.—Lower Claiborne:".
110	5	Read "Genotype by monotypy...".
111	13,14	footnote 186, read "Lovén" for "Lovën".
112	30	Read "North Carolina to West Indies and Gulf of Mexico".
123		Footnote 198, delete "Cossmann, M. and", substitute "In".
130	18	Add "No. 2786, paratype,".
132	39	Read "propeconica" for "propeconca".
135	41	Read "Ampullina" for "Ampulina".
140	17.41	; page 141, line 10, read "**Sinum declive**".
141	1,14	Read "**Sinum arctatum**".
142	11	Read "Hughes" for "Huges".
171	4	Read "patula" for "patulum".

180	17	Delete "( )" around de Gregorio..
184	23	Read "Ferussac" for "Ferrussac".
195	27	Read "fig. 14" for "fig. 13'.'
203	27	In synonymy, read "1926" for "1826".
212	17	Read **"texanus"** for **"texana"**.
219	16	Read "fig. 8" for "fig. 18".
228	17	Read **"Triphora distincta** (Meyer)".
235	36	Read "healeyi" for "healyi".
237	26	Read **"Oxycypræa"** for **"Oxcypraea"**.
239	22	Read **"texana"** for **"exana"**.
247	1	Add "plate 85, fig. 9".
250		Footnote 412, read "Schuchert" for "Schubert".
253	14	Read "figs. 12, 18" for "figs. 12-18".
268	22	Read "imperfect" for "important".
278	36	; page 279, line 15, read **"Columbellopsis"**.
284	8	Read **"Anachis (Astyris) crassus** Chavan, new species".
285	45	Add "Occurrence.—Lower Claborne: loc. 765".
296	17	Read **"lymneoides"** for **"lymneoidies"**.
299	25	Read **"bellaliratum"** for **"bellaliratus"**.
303	28	Read **"sagenus"** for **"sagenum"**; line 26, "cancellatum".
305	14,33,39	Read "texanus'.; Line 41, **"sagenus"**; Line 42, **"altus"**.
306	13	Read **"mangonizatus"** for **"mangonizatum"**.
308	18	Read **"multiplicatus"** for **"multiplicata"**.
309	4	Add "fig. 1".
319	19	Correct to read **"crebrissima"**. Given as in Lea.
323		Footnote 510, read "Sycum Bayle".
327	25	Add "fig. 9".
329	1	Read **"mortonii"** for **"montonii"**.
338	14	Delete **"Melongena"** and "( )" around **"Cornulina"**.
340	23	Add "Gosport sand: loc. 104 (type)".
344	34	Read "1883" for "1833".
346	26	Read **"limulus"** for **"limula"**.
364	21	Read **"papillata"** for **"papillatus"**.
397		Last line, add "3241" to syntypes.
416	14	Add "771".
425	18	Read **"Persicula (Bullata) semen minima** (Lea)."
443	17	Read **"smithvillense"**; line 30, **"juniperum"**.
461	25	Read "71" for "72"; "are" for "is"; line 26, "71" for "72".
491	20	Read "2391" for "2791".

To Dr Paul Bartsch
with compliments
of Katherine V. W. Pa

BULLETINS

OF

AMERICAN

PALEONTOLOGY

VOL. VII

No. 32

(In Two Parts)

PART II. PLATES

1937

Paleontological Research Institution

Ithaca, New York

BULLETINS

OF

AMERICAN PALEONTOLOGY

VOL. VII

No. 32

The Claibornian Scaphopoda, Gastropoda and Dibranchiate Cephalopoda of the Southern United States

Katherine Van Winkle Palmer, Ph. D.

PART II, PLATES

December 25, 1937

Ithaca, New York

EXPLANATION OF PLATES

(Plates furnished, ready for insertion, by the author)

Explanation of Plate 1

Figure — Page

1. **Dentalium (Antalis) thalloides claibornense**, n. var. 14
   Syntype, No. 2626, P. R. I., L. 20 mm., g. d. 4 mm.
   Gosport sand: Claiborne, Ala.
2. **Dentalium (Antalis) thalloides claibornense**, n. var. 14
   Syntype, No. 2627, P. R. I., L., 22 mm.; g. d., 4.5 mm.
   Gosport sand: Claiborne, Ala.
3. **Dentalium densatum** Conrad 15
   Copy Conrad.
4. **Dentalium** sp. 19
   Under **D. incississimum** (My. and Ald.), No. 2643,
   P. R. I., L., 11 mm.; g. d., 2 mm.
   Lower Claiborne: loc. 731.
5. **Dentalium (Antalis) thalloides claibornense** n. var. 14
   Same specimen as fig. 1, to show apical end
6. **Dentalium incississimum** (My. and Ald.) 19
   Copy, Meyer and Aldrich
7. **Dentalium (Antalis) mississippiense** Conrad 14
   No. 2628, P. R. I., L., 44 mm.; g. d., 5 mm.
   Vicksburg Oligocene: Vicksburg, Miss.
8. **Dentalium** sp. 19
   No. 2639, P. R. I., L., 16 mm.; g. d., 4 mm.
   Lower Claiborne: loc. 725.
9. **Dentalium (Antalis) blandum** de Gregorio 15
   No. 2630, P. R. I. L. (chord subtending the arc),
   24 mm.; g. d., 3 mm.
   Gosport sand: Claiborne, Ala.
10. **Dentalium (Antalis) blandum** de Gregorio 15
    No. 2631, P. R. I. L. (chord subtending the arc),
    18 mm.; g. d., 3 mm.
    Gosport sand: Claiborne, Ala.

11. **Dentalium** sp. 19
Holotype, No. 2640, P. R. I. L., 2.25 mm.; g. d., 5 mm.
Lower Claiborne: locality 741
12. **Dentalium arciforme** Conrad 16
No. 2632, P. R. I. L., 22 mm.; g. d., 3 mm. to show notch and sheath
Gosport sand: Claiborne, Ala.
13. **Dentalium arciforme** Conrad 16
No. 2633, P. R. I. L., 13 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.
14. **Dentalium arciforme** Conrad 16
Same specimen as fig. 12
15. **Dentalium arciforme** Conrad 16
Copy Conrad
16. **Dentalium (Antalis) thalloides** Conrad 12
No. 2625, P. R. I. L., 11 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.
17. **Dentalium (Antalis) mississippiense** Conrad 14
No. 2629, P. R. I., L., 20.5 mm.; g. d., 4 mm.
Vicksburg Oligocene: Vicksburg, Miss.
18. **Dentalium (Antalis) thalloides** Conrad 12
No. 2624, P. R. I. L., 11 mm.; g. d., 4 mm.
With mold of the cavity of the shell
Gosport sand: Claiborne, Ala.
19. **Dentalium (Antalis) thalloides** Conrad 12
No. 2623, P. R. I. L., 10 mm.; g. d., 1.6 mm.
Gosport sand: Claiborne, Ala.
20. **Dentalium (Antalis) thalloides** Conrad 12
No. 2622, P. R. I., L. (chord subtending the arc), 24 mm.; g. d., 3.5 mm.
Gosport sand: Claiborne, Ala.
21. **Dentalium (Antalis) thalloides** Conrad 12
No. 2621, P. R. I. L., 16 mm.; g. d., 4.5 mm.; Senile stage
Gosport sand: Claiborne, Ala.
22. **Dentalium (Antalis) thalloides** Conrad 12
No. 2620, P. R. I. L., 11 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.
23. **Dentalium (Antalis) thalloides** Conrad 12
No. 2619, P. R. I. L., 23 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.
24. **Dentalium (Antalis) thalloides** Conrad 12
No. 2618, P. R. I. L., 30 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.
25. **Dentalium (Antalis) thalloides** Conrad 12
No. 2617, P. R. I. L. (chord subtending the arc), 37 mm.; g. d., 5.5 mm.
Gosport sand: Claiborne, Ala.
26. **Dentalium (Antalis) thalloides** Conrad 12
No. 2616, P. R. I. L., 30 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

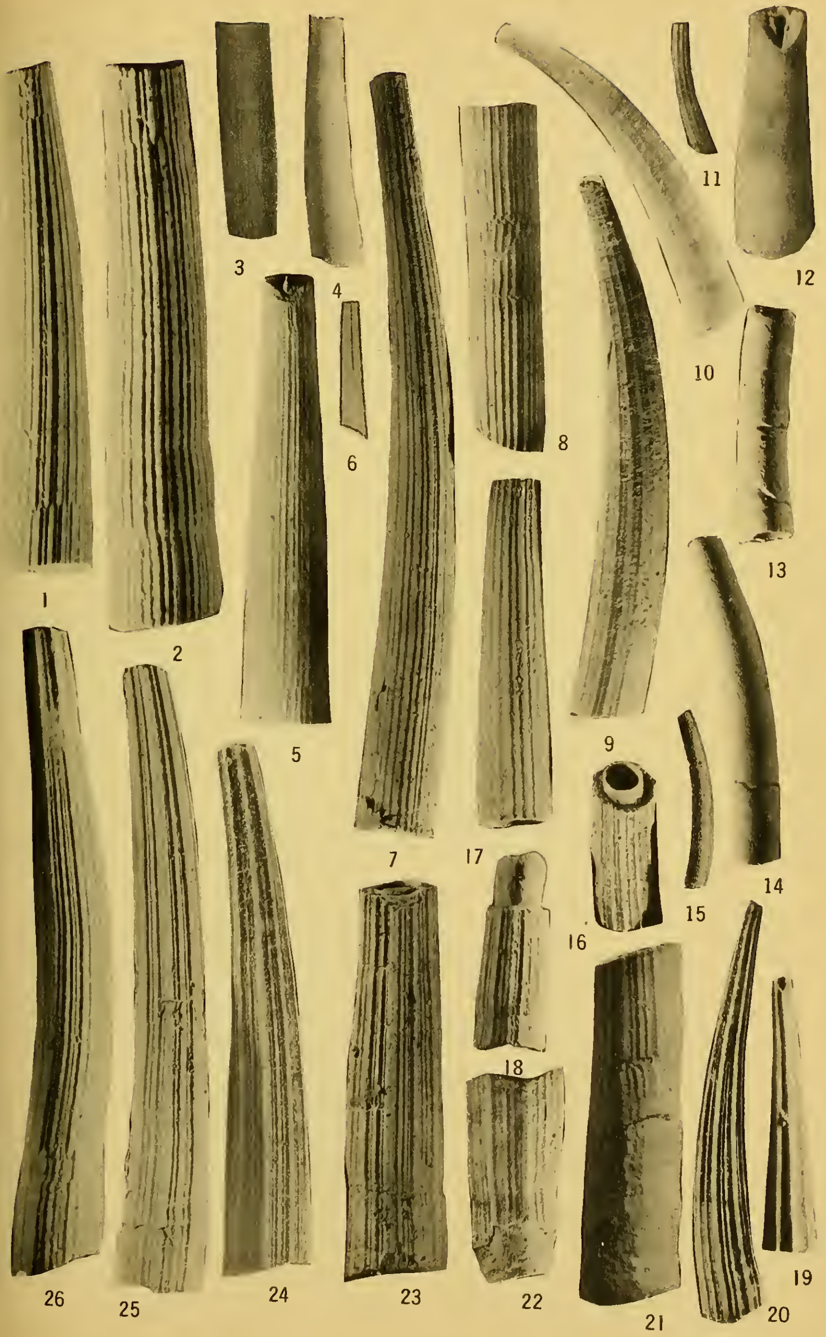

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26

PLATE 2

Explanation of Plate 2

Figure		Page
1.	**"Adeorbis" punctiformis** de Gregorio Copy De Gregorio	180
2.	**"Adeorbis" punctiformis** de Gregorio Copy De Gregorio	180
3.	**"Adeorbis" punctiformis** de Gregorio Copy De Gregorio	180
4.	**Lydiphnis novi-castri** (Van Winkle) Copy Van Winkle, Holotype No. 1399, P. R. I.	48
5.	**Lydiphnis novi-castri** (Van Winkle) Copy Van Winkle. Holotype No. 1399, P. R. I.	48
6.	**Solariorbis depressus** (Lea) No. 2652, P. R. I. H., 3 mm.; g. d., 4.5 mm. Gosport sand: Claiborne, Ala.	50
7.	**Solariorbis depressus** (Lea) Same specimen as fig. 6. dorsal view	50
8.	**Solariorbis depressus** (Lea) Same specimen as figs. 6, 7	50
9.	**"Vitrinella" virginiensis** (Van Winkle) Copy Van Winkle. Holotype, No. 1400, P. R. I.	55
10.	**Vitrinella cf. lævis** (Meyer) No. 2654, P. R. I. H., .65 mm.; g. d., 1.25 mm. Lower Claiborne: loc. 843	55
11.	**Vitrinella cf. lævis** (Meyer) Ventral view of specimen figure 10	55
12.	**Vitrinella cf. lævis** (Meyer) No. 2655, P. R. I. broken Lower Claiborne: loc. 843	55
13.	**Cadulus (Polyschides) quadriturritus** Meyer	23

No. 2646, P. R. I. L. (chord subtending the arc), 7 mm.; g. d., 1 mm.
Lower Claiborne: loc. 741

14. **Cadulus (Polyschides) quadriturritus** Meyer 23
Same specimen as fig. 13

15. **Cadulus ("Dischides") abruptus** Meyer and Aldrich 25
No. 2647, P. R. I. L., 5.5 mm.; g. d., 1.4 mm.
Lower Claiborne: loc. 728

16. **Cadulus ("Dischides") abruptus** Meyer and Aldrich 25
No. 2648, P. R. I. L., 6 mm.; g. d., 1.85 mm.
Lower Claiborne: loc. 728

17. **Cadulus depressus** Meyer 26
Copy Meyer

18. **Cadulus (Cadulus) ouachitensis,** n. sp. 21
Syntype, No. 2644, P. R. I. L., (chord), 2 mm.; g. d., .6 mm.
Lower Claiborne: loc. 741

19. **Cadulus (Cadulus) ouachitensis,** n. sp. 21
Syntype No. 2645, P. R. I. L., (chord), 2 mm.; g. d., .6 mm.
Lower Claiborne: loc. 741

20. **Teinostoma texanum,** n. sp. 46
Holotype, No. 2658, P. R. I. H., 1.25 mm.; g. d., 3.5 mm.
Lower laiborne: loc. 723

21. **Teinostoma texanum,** n. sp. 46
Ventral view specimen fig. 20

22. **Teinostoma texanum,** n. sp. 46
Dorsal view specimen figs. 20, 21

23. **Cadulus ("Dischides") abruptus** Meyer and Aldrich 25
No. 2649, P. R. I. L. (chord), 7.5 mm.; g. d., 1.05 mm.
Lower Claiborne: loc. 733

24. **Cadulus ("Dischides") abruptus** Meyer and Aldrich 25
No. 2650, P. R. I. L. (chord), 6 mm.; g. d., 1 mm.
Lower Claiborne: loc. 733

25. **Cadulus ("Dischides") abruptus** Meyer and Aldrich 25
Acad. Nat. Sci. Phila. No. 8810. L. (chord), 10 mm.; g. d., 1.5 mm.
Sabine Eocene: Thomasville, Ala.

26. **Cadulus (Dischides) subcoarcuatus** (Gabb) 24
No. 2651, P. R. I. L. (chord), 5 mm.; g. d., 1 mm.

27. **Teinostoma harrisi,** n. sp. 47
Syntype No. 2656, P. R. I. H., .6 mm.; g. d., 1.25 mm.
Lower Claiborne: loc. 843

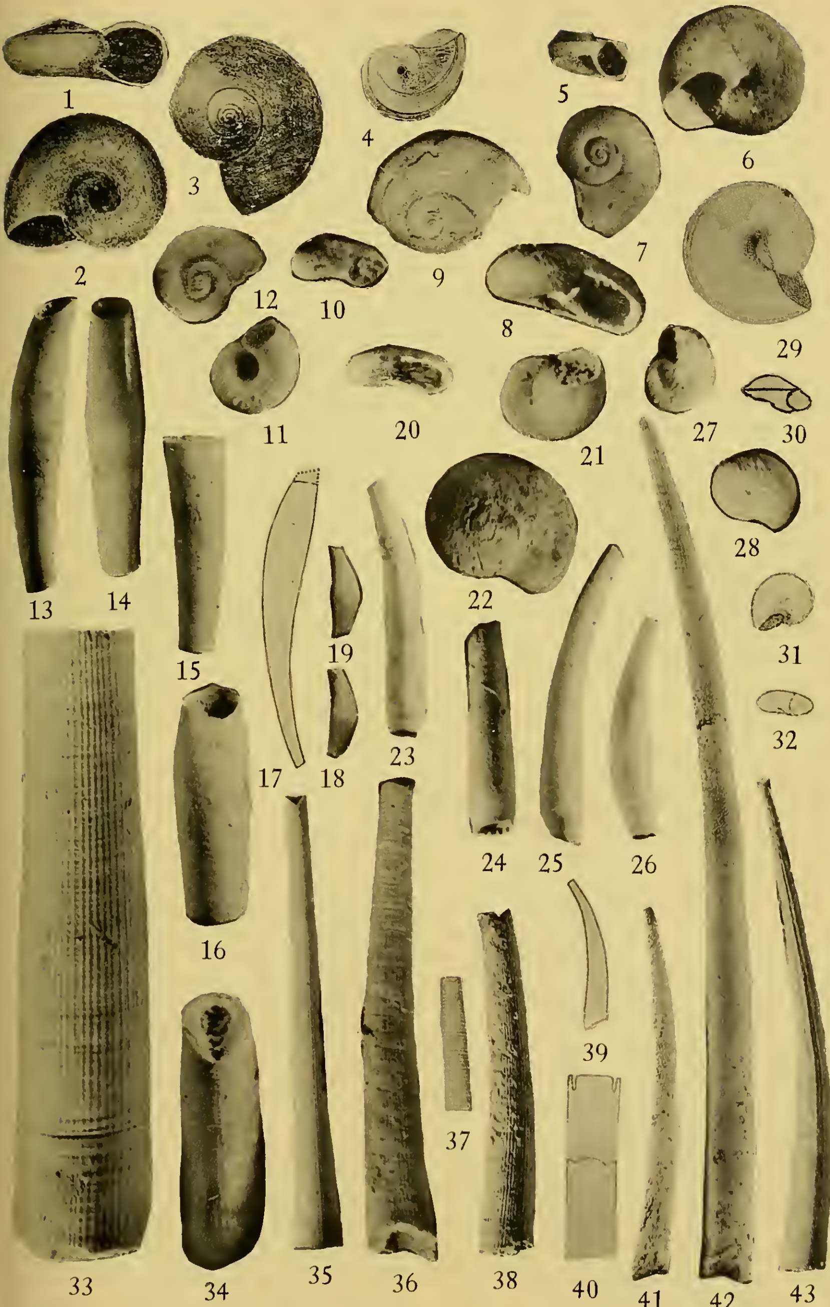
28. **Teinostoma harrisi,** n. sp. 47
Syntype No. 2657, P. R. I. H., .7 mm.; g. d., 1.25 mm.
Lower Claiborne: loc. 843

29. **Teinostoma angulare** Meyer 46
Copy Meyer

30. **Teinostoma angulare** Meyer 46
Copy Meyer

31. **Teinostoma subrotundum** Meyer 47
Copy Meyer

32. **Teinostoma subrotundum** Meyer 47
Copy Meyer


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43

33. **Dentalium (Antalis) minutistriatum** Gabb 17
No. 2634, P. R. I. L., 19 mm.; g. d., 4 mm.
Lower Claiborne: loc. 741

34. **Dentalium (Antalis) minutistriatum** Gabb 17
No. 2635, P. R. I. L., 7 mm.; g. d., 1.3 mm.
Lower Claiborne: loc. 741

35. **Dentalium (Antalis) minutistriatum** Gabb 17
No. 2636, P. R. I. L., 14 mm.; g. d., 2 mm.
Lower Claiborne: loc. 725

36. **Dentalium (Antalis) minutistriatum** Gabb 17
No. 2637, P. R. I. L., 18 mm.; g. d., 2 mm.
Lower Claiborne: loc. 741

37. **Dentalium "annulatum"** Meyer 19
Copy Meyer

38. **Dentalium (Antalis) minutistriatum** Gabb 17
No. 2638, P. R. I. L., 16 mm.; g. d., 2.5 mm.
Lower Claiborne: loc. 136

39. **Cadulus (Polyeschides) newtonensis** Meyer and Aldrich 22
Copy, Meyer and Aldrich

40. **Cadulus (Polyschides) newtonensis** Meyer and Aldrich 22
Copy, Meyer and Aldrich

41. **Dentalium (Antalis) minutistriatum** Gabb 17
No. 3411, P. R. I. L. (chord), 24 mm.; g. d., 2 mm.
Lower Claiborne: loc. 136

42. **Dentalium micro-stria** Heilprin 19
No. 2641, P. R. I. L. (chord), 57 mm.; g. d., 3 mm.
Sabine Eocene: Woods Bluff, Ala.

43. **Dentalium micro-stria** Heilprin 19
No. 2642, P. R. I. L. (chord), 47 mm.; g. d., 3 mm.
Sabine Eocene: Woods Bluff, Ala.

PLATE 3

EXPLANATION OF PLATE 3

Figure		Page
1.	**Puncturella (Fissurisepta) altior** (Meyer and Aldrich)	30
	No. 2659, P. R. I. L., 18± mm.; w., 13 mm.; h., 12 mm. (broken)	
	Lower Claiborne: loc. 728	
2.	**Diodora tenebrosa** (Conrad)	27
	No. 2661, P. R. I. L., 6 mm.; w., 4 mm.; h., 2 mm.	
	Lower Claiborne: loc. 728	
3.	**Puncturella (Fissurisepta) altior** (Meyer and Aldrich)	30
	No. 2660, P. R. I. L., 14 mm.; w., 10 mm.; h., 10 mm.	
	Lower Claiborne: loc. 731	
4.	**Diodora infrequens** (Aldrich)	29
	Copy Aldrich	
5.	**Diodora infrequens** (Aldrich)	29
	Copy Aldrich	
6.	**Puncturella (Fissurisepta) altior** (Meyer and Aldrich)	30
	Same specimen as fig. 3	
7.	**Diodora tenebrosa** (Con.)	27
	No. 2662, P. R. I. L., 16 mm.; w., 13 mm.; h., 9 mm.	
	Gosport sand: Claiborne, Ala.	
8.	**Puncturella (Fissurisepta) altior** (Meyer and Aldrich)	30
	Same specimen as fig. 1	
9.	**Diodora tenebrosa** (Con.)	27
	Same specimen as fig. 2	
10.	**Diodora tenebrosa** (Con.)	27
	No. 2663, P. R. I. L., 32 mm.; w., 26 mm.; h., 15 mm.	
	Gosport sand: Claiborne, Ala.	
11.	**Emarginata arata** (Con.)	32
	No. 2665, P. R. I. H., 15 mm. (broken)	
	Gosport sand: Claiborne, Ala.	
12.	**Diodora tenebrosa** (Conrad)	27
	No. 2664, P. R. I. H., 20 mm.; w., 15 mm.; h., 10 mm.	
	Gosport sand: Claiborne, Ala.	
13.	**Diodora tenebrosa** (Conrad)	27
	Same specimen as fig. 12	
14.	**Emarginata arata** (Con.)	32
	No. 2666, P. R. I. L., 28 mm.; w., 21 mm.; m., 13 mm.	
	Gosport sand: Claiborne, Ala.	
15.	**Emarginata arata** (Conrad)	32
	Same specimen as fig. 14	
16.	**Emarginata arata** (Conrad)	32
	Same specimen as figs. 14, 15	

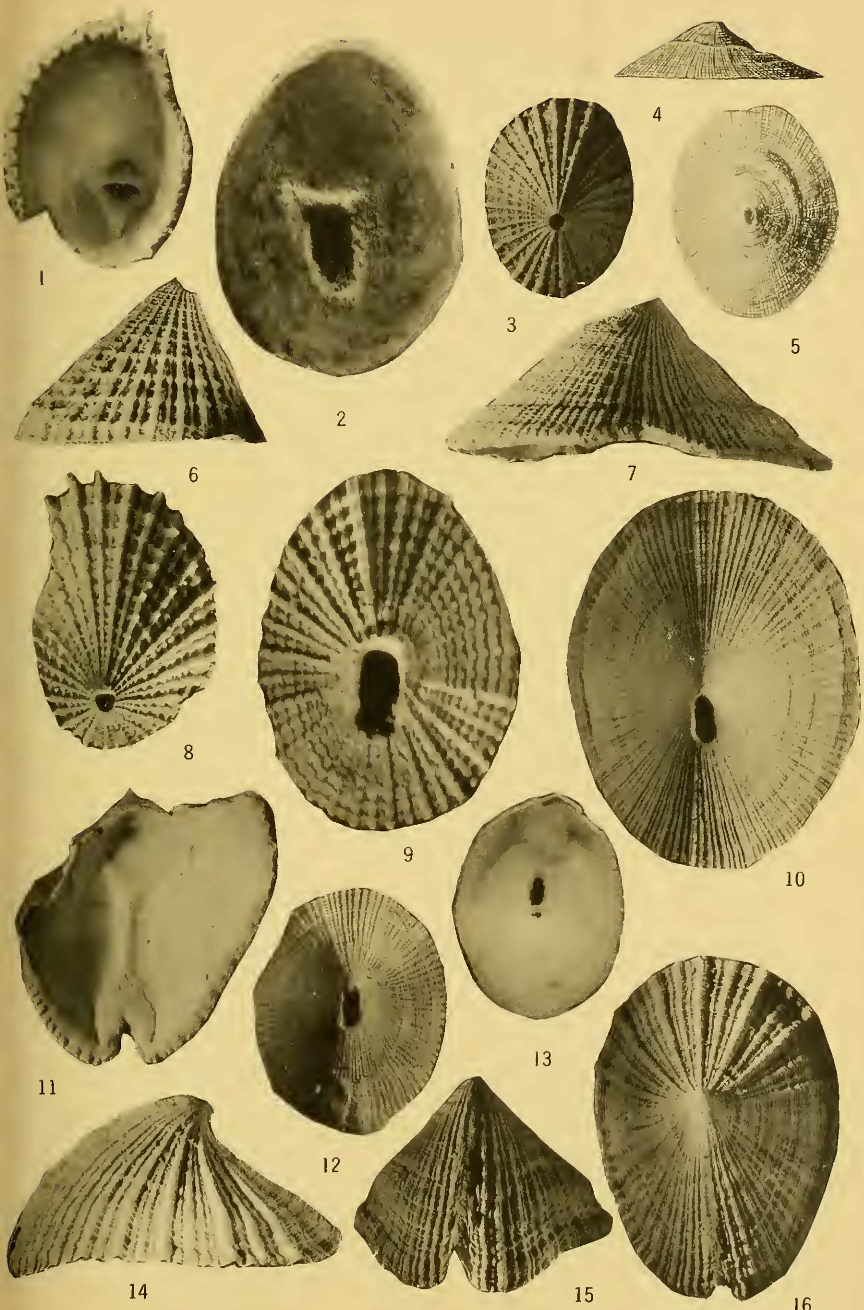

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

PLATE 4

EXPLANATION OF PLATE 4

Figure		Page
1.	Solariella louisiana Dall No. 2667, P. R. I. H., 6 mm.; g. d., 8 mm. Sabine: Woods Bluff, Ala.	38
2.	Solariella louisiana Dall Same specimen as fig. 1	38
3.	Solariella louisiana Dall Copy Dall	38
4.	Solariella louisiana Dall Same specimen as figs. 1, 2	38
5.	Solariella tricostata (Con.) No. 2670, P. R. I. H., 5 mm.; g. d., 6 mm. Gosport sand: Claiborne, Ala.	37
6.	Solariella louisiana Dall No. 2668, P. R. I. H., 6 mm.; g. d., 6.5 mm. Sabine: Woods Bluff, Ala.	38
7.	Solariella stalagmium modesta (Meyer and Aldrich) No. 2671, P. R. I. H., 4 mm.; g. d., 7 mm. Lower Claiborne: locality 731	35
8.	Solariella tricostata (Con.) Same specimen as fig. 5	37
9.	Solariella cancellata (Con.) No. 2672, P. R. I. H., 4 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	36
10.	Solariella louisiana Dall No. 2669, P. R. I. H., 7 mm.; g. d., 6 mm. Sabine: Woods Bluff, Ala.	38
11.	Solariella stalagmium modesta (Meyer and Aldrich) Same specimen as fig. 7	35
12.	Solariella tricostata (Con.) Same specimen as figs. 5, 8	36
13.	Solariella cancellata (Con.) Same specimen as fig. 9	36
14.	Solariella louisiana Dall Copy Dall	38
15.	Solariella stalagmium (Con.) No. 2673, P. R. I. H., 3 mm.; g. d., 4 mm. Gosport sand: Claiborne, Ala.	33
16.	Solariella stalagmium (Con.) Same specimen as fig. 15	33
17.	Solariella cancellata (Con.) Same specimen as figs. 9, 13	36
18.	Solariella stalagmium (Con.) Solarium supravenustum de Gregorio. Copy De Gregorio.	33
19.	Solariella stalagmium (Con.) No. 2674, P. R. I. H., 4 mm.; g. d., 7 mm. Gosport sand: Claiborne, Ala.	33
20.	Solariella stalagmium (Con.) Solarium supravenustum de Gregorio. Copy De Gregorio.	33
21.	Solariella stalagmium (Con.) Same specimen as fig. 19	33


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

PLATE 5

Explanation of Plate 5

Figure		Page
1.	**"Turbo sp."** de Gregorio Copy De Gregorio	60
2.	**Turbo zecus** de Gregorio Copy De Gregorio	60
3.	**Tiburnus texanus** (Harris) No. 2675, P. R. I. H., 1.25 mm.; g. d., 1.95 mm. Lower Claiborne: loc. 725	57
4.	**Tubiola nautiloides** (Aldrich) Copy Aldrich	45
5.	**Tiburnus texanus** (Harris) No. 2676, P. R. I. H., 10 mm.; g. d., 1.25+ mm. (broken) Lower Claiborne: loc. 725	57
6.	**Tiburnus texanus** (Harris) Same specimen as fig. 5	57
7.	**Tiburnus texanus** (Harris) McConnell drawing, holotype Lower Claiborne: K. Jones farm, Hurricane Bayou, Houston Co., Texas	57
8.	**"Trochus" gumus** de Gregorio Copy De Gregorio	44
9.	**Tubiola nautiloides** (Aldrich) Copy Aldrich	45
10.	**Tubiola nautiloides** (Aldrich) Copy Aldrich	45
11.	**Norrisia nautiloides** (Aldrich) Copy Aldrich. H., 1.5 mm.; g. d., 5 mm.	41

12. **"Trochus" gumus** de Gregorio 44
Copy De Gregorio
13. **"Trochus" gumus** de Gregorio 44
Copy De Gregorio
14. **Cirsochilus claibornensis** (Dall) 60
Copy Dall
15. ? **Solariella aldrichiana** (Harris) 40
Harris drawing, holotype
16. **Circulus sotoensis** (Aldrich) 53
Copy Aldrich
17. **Norrisia nautiloides** (Aldrich) 41
Copy Aldrich
18. **Solariella fungina** Cossmann 39
Copy Cossmann
19. **Cirsochilus (Claibornia) lineatus** (Lea) 58
No. 2677, P. R. I. H., 2.25 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.
20. **Circulus sotoensis** (Aldrich) 53
Copy Aldrich
21. **Tiburnus eboreus** (Conrad) 56
No. 2678, P. R. I. H., 5 mm.; g. d., 5.5 mm.
Gosport sand: Claiborne, Ala.
22. **Tiburnus eboreus** (Conrad) 56
Same specimen as figs. 21, 25, 26, 29
23. **Cirsochilus (Claibornia) lineatus** (Lea) 58
Same specimen as fig. 19
24. **Norrisia nautiloides** (Aldrich) 41
Copy Aldrich
25. **Tiburnus eboreus** (Conrad) 56
Same specimen as figs. 21, 22, 26, 29
26. **Tiburnus eboreus** (Conrad) 56
Same specimen as figs. 21, 22, 25, 29
27. **Circulus sotoensis** (Aldrich) 53
Copy Aldrich
28. **Circulus exacuus** (Conrad) 53
No. 2679, P. R. I. H., 4 mm.; g. d., 9.5 mm.
Gosport sand: Claiborne, Ala.
29. **Tiburnus eboreus** (Conrad) 56
Same specimen as figs. 21, 22, 25, 26
30. **Cirsochilus (Claibornia) lineatus** (Lea) 58
Same specimen as figs. 19, 23
31. **Delphinula concionaria** de Gregorio 44
Copy De Gregorio
32. **Norrisia (Norrisella) nitens** (Lea) 41
No. 2680, P. R. I. H., 5 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.
33. **Norrisia (Norrisella) nitens** (Lea) 41
No. 2681, P. R. I. H., 4 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.
34. **Circulus exacuus** (Conrad) 53
Same specimen as fig. 28
35. **Norrisia (Norrisella) micromphalus** (Cossmann) 43
Copy Cossmann
36. **Norrisia (Norrisella) micromphalus** (Cossmann) 43
Copy Cossmann
37. **Circulus exacuus** (Conrad) 53
Same specimen as figs. 28, 34

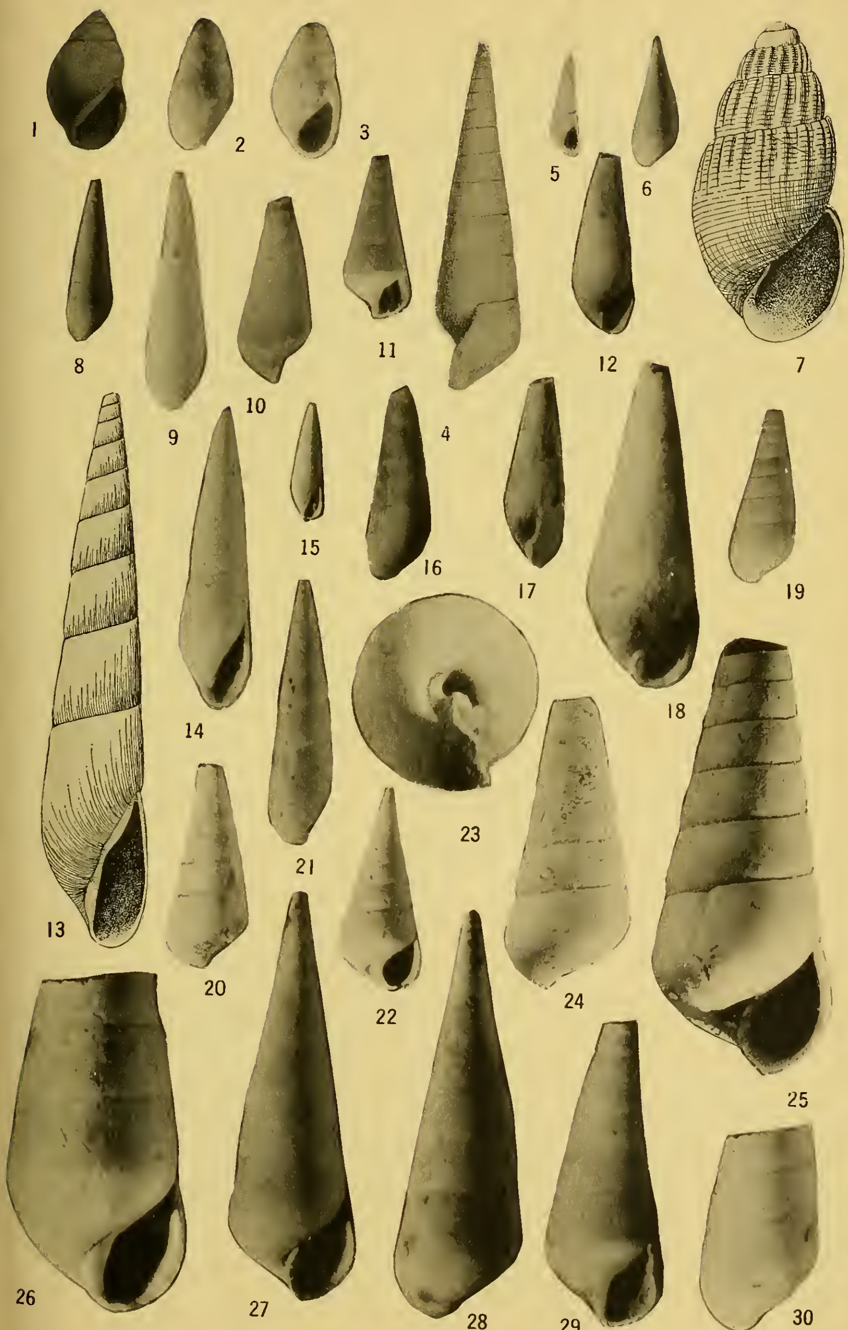

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37

PLATE 6

EXPLANATION OF PLATE 6

Figure		Page
1.	**Pasitheola tornatelloides** (Meyer) Copy Meyer	70
2.	**Pasitheola guttula** (Lea) No. 2682, P. R. I. H., 2.05 mm.; g. d., 1.15 mm. Gosport sand: Claiborne, Ala.	69
3.	**Pasitheola guttula** (Lea) No. 2683, P. R. I. H., 2.05 mm.; g. d., 1.0 mm. Gosport sand: Claiborne, Ala.	69
4.	**Rissoina (Leaella) cossmanni** (Aldrich) Copy Cossmann	154
5.	**Melanella tenaxa** Palmer Copy Gabb	66
6.	**Melanella exilis** (Gabb) No. 2684, P. R. I. H., 4+ mm.; g. d., .95 mm. Lower Claiborne: loc. 723	64
7.	**Odostomia (Pyrgulina) claibornensis** Aldrich Copy Aldrich	86
8.	**Melanella extremis** (Aldrich) No. 2686, P. R. I. H., 5.5 mm.; g. d., 1.10 mm. Lower Claiborne: loc. 723	65
9.	**Melanella extremis** (Aldrich) No. 2687, P. R. I. H., 6 mm.; g. d., 1.25 mm. Lower Claiborne: loc. 723	65
10.	**Melanella claibornia**, n. sp. No. 2690, P. R. I., syntype. H., 5 mm.; g. d., 1.5 mm. Gosport sand: Claiborne, Ala.	62

11. **Melanella clabornia, n. sp.** 62
No. 2691, P. R. I., syntype. H., 6 mm.; g. d., 2.5 mm.
Gosport sand: Claiborne, Ala.
12. **Melanella exilis** (Gabb) 64
No. 2685, P. R. I. H., 5 mm.; g. d., .80 mm.
Lower Claiborne: loc. 743
13. **Melanella extremis** (Aldrich) 65
Copy Aldrich
14. **Melanella extremis** (Aldrich) 65
No. 2688, P. R. I. H., 7 mm.; g. d., 1.45 mm.
Lower Claiborne: loc. 723
15. **Melanella extremis** (Aldrich) 65
No. 2689, P. R. I. H., 4 mm.; g. d., .9 mm.
Gosport sand: Claiborne, Ala.
16. **Melanella exilis** (Gabb) 64
Same specimen as figs. 12, 17
17. **Melanella exilis** (Gabb) 64
Same specimen as figs. 12, 16
18. **Melanella aciculata** (Lea) 63
No. 2692, P. R. I. H., 8 mm.; g. d., 2.5 mm.
Gosport sand: Claiborne, Ala.
19. **Melanella aciculata** (Lea) 63
Same specimen as fig. 18
20. **Melanella notata** (Lea) 61
No. 2693, P. R. I. H., 5+ mm.; g. d., 2 mm.
Gosport sand: Claiborne, Ala.
21. **Melanella extremis** (Aldrich) 65
Same specimen as fig. 14
22. **Niso umbilicata** (Lea) 66
No. 2697, P. R. I. H., 8 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.
23. **Niso umbilicata** (Lea) 66
Same specimen as fig. 22
24. **Niso umbilicata** (Lea) 66
No. 2698, P. R. I. H., 16.5 mm.; g. d., 7 mm.
Gosport sand: Claiborne, Ala.
25. **Niso umbilicata** (Lea) 66
Same specimen as fig. 24
26. **Melanella notata** (Lea) 61
No. 2694, P. R. I. H., 6 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.
27. **Melanella notata** (Lea) 61
No. 2695, P. R. I. H., 10 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.
28. **Melanella notata** (Lea) 61
Same specimen as fig. 27
29. **Melanella notata** (Lea) 61
No. 2696, P. R. I. H., 5 mm.; g. d., 2 mm.
Gosport sand: Claiborne, Ala.
30. **Melanella notata** (Lea) 61
Same specimen as fig. 26


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Explanation of Plate 7

Same specimen as fig. 15

18. **Pyramidella bastropensis** Harris 78
No. 2713, P. R. I. H., 6.5 mm.; g. d., 1.4 mm.
Lower Claiborne: loc. 723

19. **Pyramidella bastropensis** Harris 78
No. 2712, P. R. I. H., 18 mm.; g. d., 3 mm.
Lower Claiborne: loc. 733

20. **Pyramidella bastropensis** Harris 78
No. 2711, P. R. I. H., 5 mm.; g. d., 1.1 mm.
Lower Claiborne: loc. 723

21. **Pyramidella perexilis** (Conrad) 75
McConnell drawing. H., 4.5 mm.
Lower Claiborne: Little Brazos River, Texas

22. **Odostomia (Evalea) melanella** (Lea) 83
No. 2709, P. R. I. H., 10 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

23. **Odostomia (Evalea) melanella** (Lea) 83
Same specimen as fig. 13

24. **Pyramidella perexilis** (Conrad) 75
Syrnola dalli Cossmann Copy Cossmann

25. **Pyramidella pseudopygmæa**, n. sp. 77
No. 2714, P. R. I., paratype. H., 4 mm.; g. d., 2 mm.
Lower Claiborne: loc. 723

26. **Odostomia trapaquara** (Harris) 82
No. 2719, P. R. I. H., 3 mm.; g. d., 1.1 mm.
Lower Claiborne: loc. 727

27. **Odostomia trapaquara** (Harris) 82
No. 2720, P. R. I. H., 3.5 mm.; g. d., 1.55 mm.
Lower Claiborne: loc. 727

28. **Pyramidella pseudopygmæa**, n. sp. 77
No. 2715, P. R. I., holotype. H., 5 mm.; g. d., 2 mm.
Gosport sand: Claiborne, Ala.

29. **Pyramidella pseudopygmæa**, n. sp. 77
No. 2716, P. R. I., paratype. H., 4 mm.; g. d., 3.5 mm.
Gosport sand: Claiborne, Ala.

30. **Pyramidella pseudopygmæa**, n. sp. 77
No. 2717, P. R. I., paratype. H., 4 mm.; g. d., 1.25 mm.
Lower Claiborne: loc. 723

31. **Pyramidella (Longchævus) larvata** Conrad 71
No. 2721, P. R. I. H., 13 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.

32. **Pyramidella (Lonchævus) larvata** Conrad 71
Same specimen as fig. 31

33. **Pyramidella (Lonchævus) larvata** Conrad 71
No. 2722, P. R. I. H., 13 mm.; g. d., 5.5 mm.
Gosport sand: Claiborne, Ala.

34. **Pyramidella (Longchævus) larvata** Conrad 71
No. 2723, P. R. I. H., 14 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.

35. **Pyramidella pseudopymæa**, n. sp. 77
No. 2718, P. R. I., paratype. H., 4 mm.; g. d., 2 mm.
Lower Claiborne: loc. 723

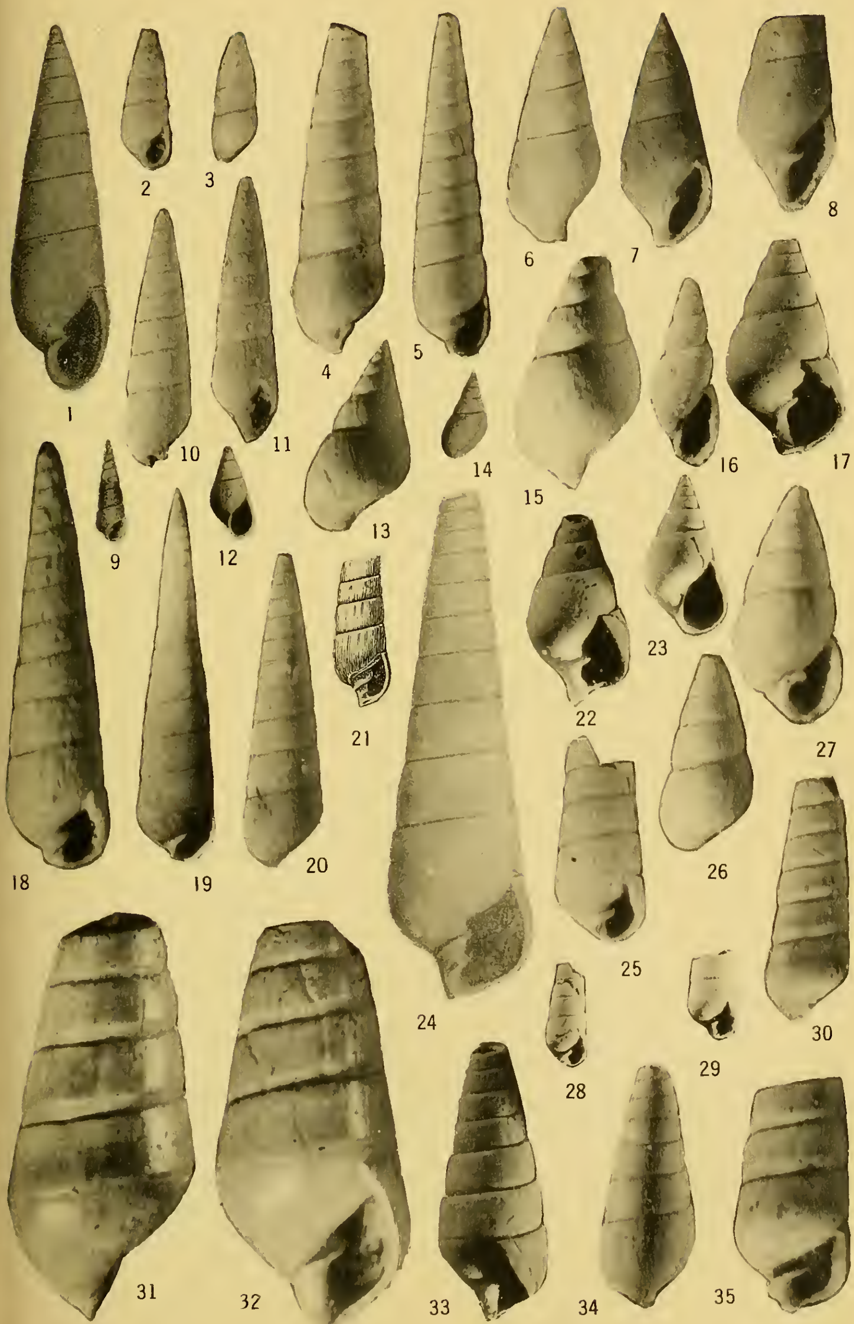

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

PLATE 8

Explanation of Plate 8

Figure		Page
1.	**Pyramidella (Ulfa) cossmanni** Dall and Bartsch Copy Cossmann, 1921, pl. V, fig. 26	74
2.	**Pyramidella (Ulfa) chavani,** n. sp. No. 2724, P. R. I., syntype. H., 6 mm.; g. d., 2 mm. Lower Claiborne: loc. 741	73
3.	**Turbonilla bidentata** (Meyer) Copy Meyer	80
4.	**Turbonilla neglecta** Meyer Copy Meyer	81
5.	**Pyramidella (Ulfa) chavani,** n. sp. No. 2729, P. R. I., syntype. H., 9 mm.; g. d., 4 mm. Lower Claiborne: loc. 741	73
6.	**Pyramidella (Ulfa) chavani,** n. sp. No. 2730, P. R. I., syntype. Lost. Lower Claiborne: loc. 741	73
7.	**Turbonilla (Ptycheulimella) sabina,** n. sp. No. 1386, P. R. I., holotype. H., 9 mm.; g. d., 3 mm. Sabine: Woods Bluff, Ala.	81
8.	**"Aclis" modesta** Meyer Copy Meyer	111
9.	**Pyramidella (Ulfa) cossmanni** Dall and Bartsch Copy Cossmann, 1921, pl. V, fig. 25	74

10. **Pyramidella (Ulfa) cossmanni** Dall and Bartsch — 74
Copy Cossmann, 1921, pl. V, fig. 27
11. **Turbonilla neglecta** Meyer — 81
Copy Meyer
12. **Pyramidella (Ulfa) chavani**, n. sp. — 73
No. 2725=2724, P. R. I. Same specimen as fig. 2
13. **Pyramidella (Ulfa) chavani**, n. sp. — 73
No. 2726, P. R. I., syntype. H., 6 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.
14. **Pyramidella (Ulfa) chavani**, n. sp. — 73
Same specimen as fig. 13
15. **Pyramidella (Ulfa) chavani**, n. sp. — 73
No. 2727, P. R. I., syntype. H., 10 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.
16. **Scalina staminea** (Conrad) — 102
Holotype, A. N. S. H., 15 mm.; g. d., 8 mm.
17. **Pliciscala (Cylindriscala) albitesta** (Meyer and Aldrich) — 109
Copy Meyer and Aldrich
18. **Rudiscala harrisi**, n. sp. — 107
No. 1380, P. R. I., holotype. H., 5 mm.; g. d., 2 mm.
Sabine: Woods Bluff, Ala.
19. **Pyramidella (Ulfa) chavani**, n. sp. — 73
No. 2728, P. R. I., syntype. H., 10 mm.; g. d., 3.5 mm.
Lower Claiborne: loc. 741
20. **Pyramidella (Ulfa) chavani**, n. sp. — 73
Same specimen as figs. 13, 14
21. **Scalina trapaquara engona** (Harris) — 103
No. 2732, P. R. I. H., 13 mm.; g. d., 5.5 mm.
Lower Claiborne: loc. 731
22. **Epitonium (Elegantiscala) kingæ**, n. sp. — 96
No. 2731, P. R. I., holotype. H., 4 mm.; g. d., 1 mm.
Lower Claiborne: loc. 741
23. **Epitonium (Elegantiscala) kingæ**, n. sp. — 96
Same specimen as fig. 22
24. **Scalina trapaquara** (Harris) — 103
McConnell drawing, holotype
Lower Claiborne: Brazos River, Moseley's Ferry, Texas
25. **Scalina trapaquara engona** (Harris) — 103
McConnell drawing, holotype
26. **Scalina trapaquara** (Harris), — 103
No. 2733, P. R. I., H., 8 mm.; g. d., 3.5 mm.
Lower Claiborne: loc. 138
27. **Scalina trapaquara adamsi**, n. var. — 104
No. 2737, P. R. I., holotype. H., 23 mm.; g. d., 9 mm.
Lower Claiborne: loc. 727
28. **Scalina trapaquara adamsi**, n. var. — 104
Same specimen as fig. 27
29. **Scalina trapaquara** (Harris), — 103
No. 2734, P. R. I., H., 15 mm.; g. d., 8 mm.
Lower Claiborne: loc. 138
30. **Scalina trapaquara** (Harris) — 103
No. 2736, P. R. I., H., 14 mm.; g. d., 9 mm.
Lower Claiborne: loc. 708
31. **Scalina trapaquara** (Harris) — 103
No. 2735, P. R. I., H., 14 mm.; g. d., 5 mm.
Lower Claiborne: loc. 138

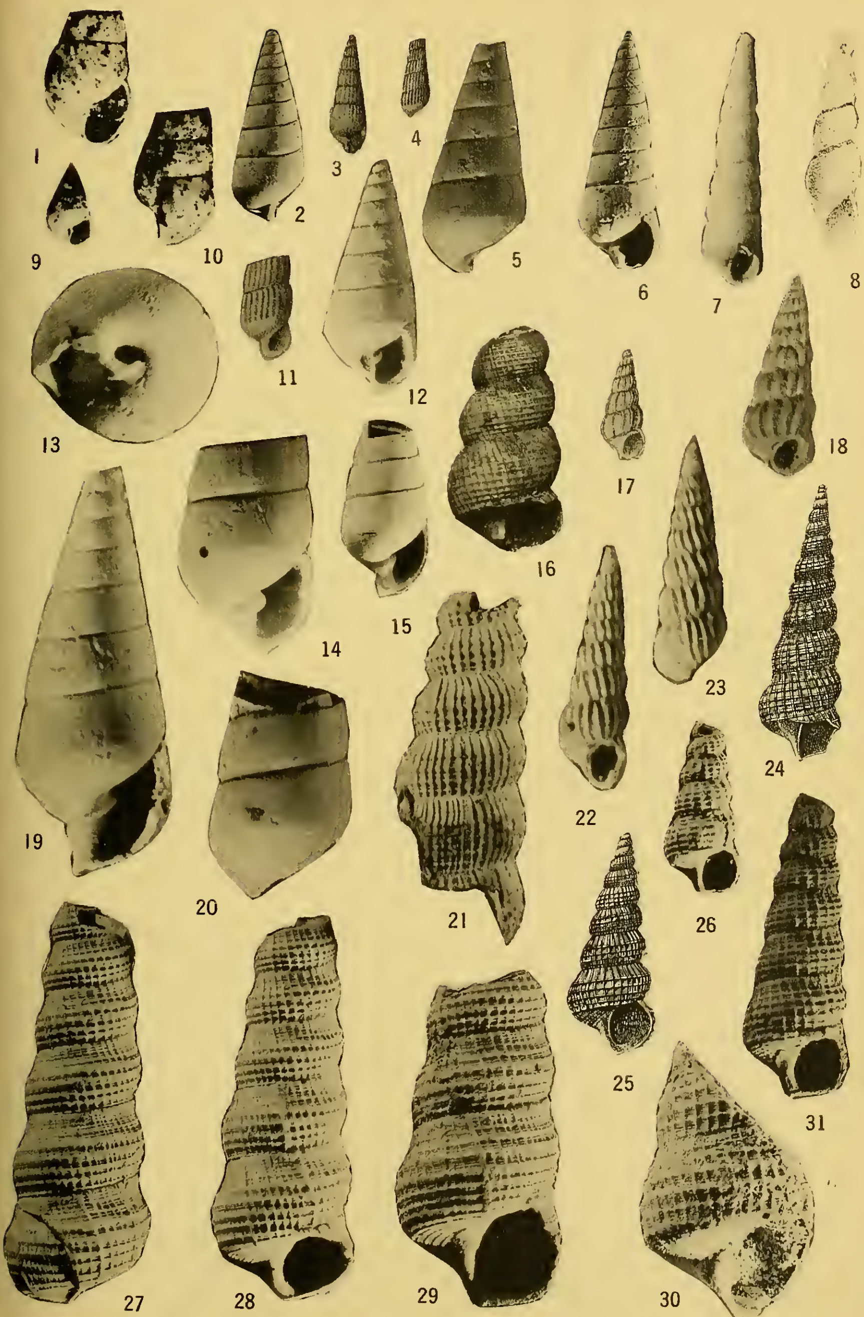

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

PLATE 9

EXPLANATION OF PLATE 9

Figure		Page
1.	**Mathilda claibornensis** Aldrich Copy Aldrich	88
2.	**Mathilda retisculpta** (Meyer and Aldrich) Copy Meyer and Aldrich	87
3.	**Tuba cancellata** (H. C. Lea) Copy **Actæonema striata** Conrad, 1865, pl. 11, fig. 2	93, 156
4.	**Tuba cancellata** (H. C. Lea) No. 2738, P. R. I., H., 10 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	93
5.	**Tuba cancellata** (H. C. Lea) No. 2739, P. R. I., H., 8 mm.; g. d., 3 mm. Gosport sand: Claiborne, Ala.	93
6.	**Tuba cancellata** (H. C. Lea) Copy **Eglisia pulchra** Meyer, 1886	93
7.	**Mathilda regularis** (Meyer) Copy Meyer	89
8.	**Tuba antiquata texana,** n. var. No. 2743, P. R. I., holotype, H., 17 mm.; g. d., 10 mm. Lower Claiborne: loc. 733	92
9.	**Tuba antiquata texana,** n. var. No. 2744, P. R. I., paratype. H., 11 mm.; g. d., 8 mm. Lower Claiborne: loc. 733	92
10.	**Tuba cancellata** (H. C. Lea) No. 2740, P. R. I. H., 6.5 mm.; g. d., 3 mm. Gosport sand: Claiborne, Ala.	93
11.	**Mathilda retisculpta aldrichi,** n. var. No. 2741, P. R. I., paratype. H., 10 mm.; g. d., 6 mm. Lower Claiborne: loc. 708	87
12.	**Tuba antiquata** (Conrad) No. 2746, P. R. I., H., 14 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	90
13.	**Tuba antiquata** (Conrad) Same specimen as fig. 12	90
14.	**Mathilda retisculpta aldrichi,** n. sp. No. 2742, P. R. I., holotype. H., 10 mm.; g. d., 5 mm. Lower Claiborne: loc. 708	87
15.	**Tuba antiquata striata** Lea No. 2747, P. R. I. H., 10 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	91
16.	**Tuba antiquata striata** Lea No. 2748, P. R. I. H., 14 mm.; g. d., 10 mm. Lower Claiborne: loc. 723	91
17.	**Tuba antiquata striata** Lea Same specimen as fig. 16	91
18.	**Tuba antiquata striata** Lea No. 2749, P. R. I. H., 18 mm.; g. d., 12 mm. Lower Claiborne: loc. 766	91

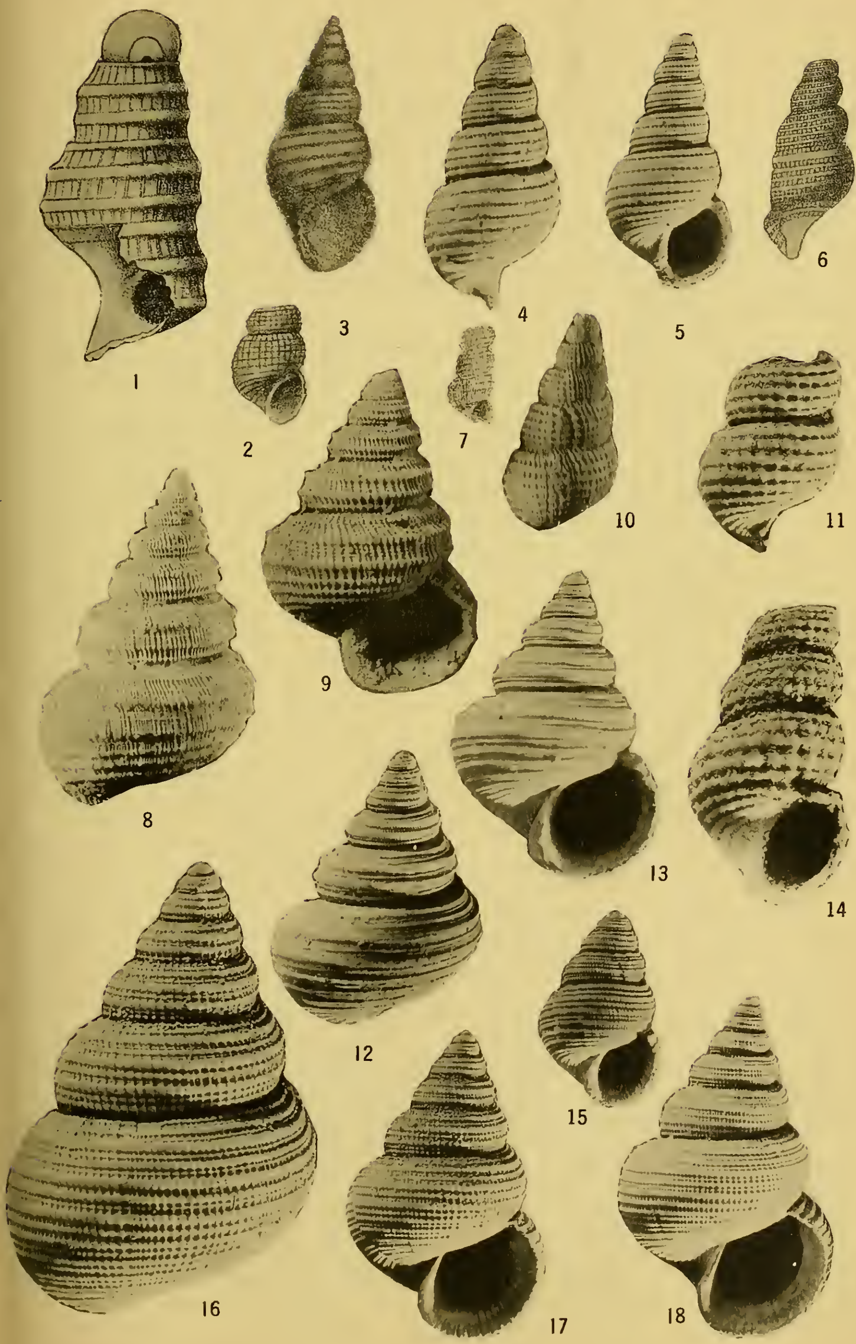

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

PLATE 10

EXPLANATION OF PLATE 10

Figure		Page
1.	**Cirsotrema (Coroniscala) claibornensis** (Conrad) Copy Conrad	99
2.	**Epitonium jacobi, n. sp.** No. 2750, P. R. I., holotype. H., 5 mm.; g. d., .75 mm. Lower Claiborne: loc. 741	94
3.	**Epitonium jacobi, n. sp.** No. 2751, P. R. I., paratype. H., 2.55 mm.; g. d., .65 mm. Lower Claiborne: loc. 741	94
4.	**Epitonium jacobi, n. sp.** Same specimen as fig. 2	94


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

PLATE 11

EXPLANATION OF PLATE 11

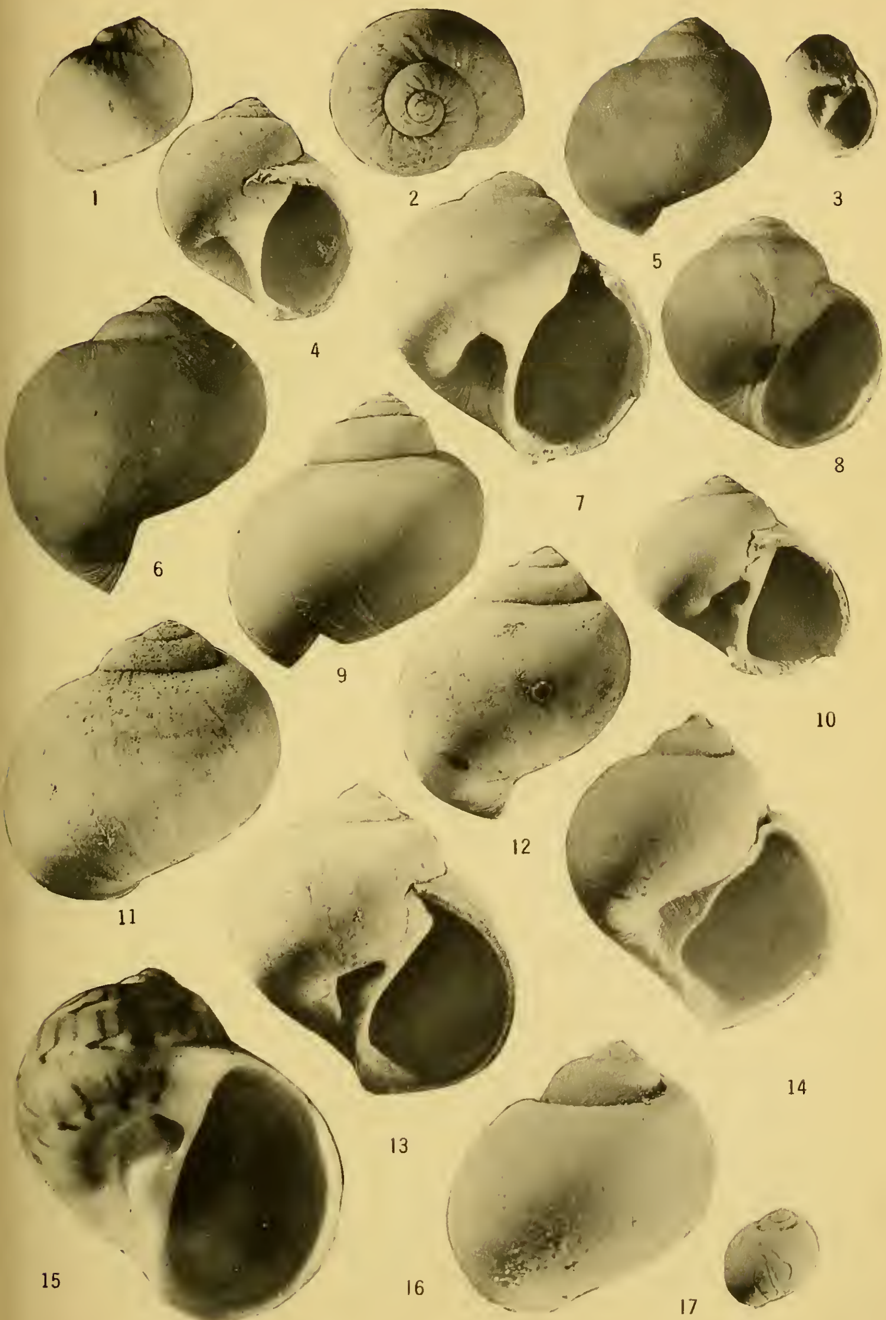

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

PLATE 12

EXPLANATION OF PLATE 12

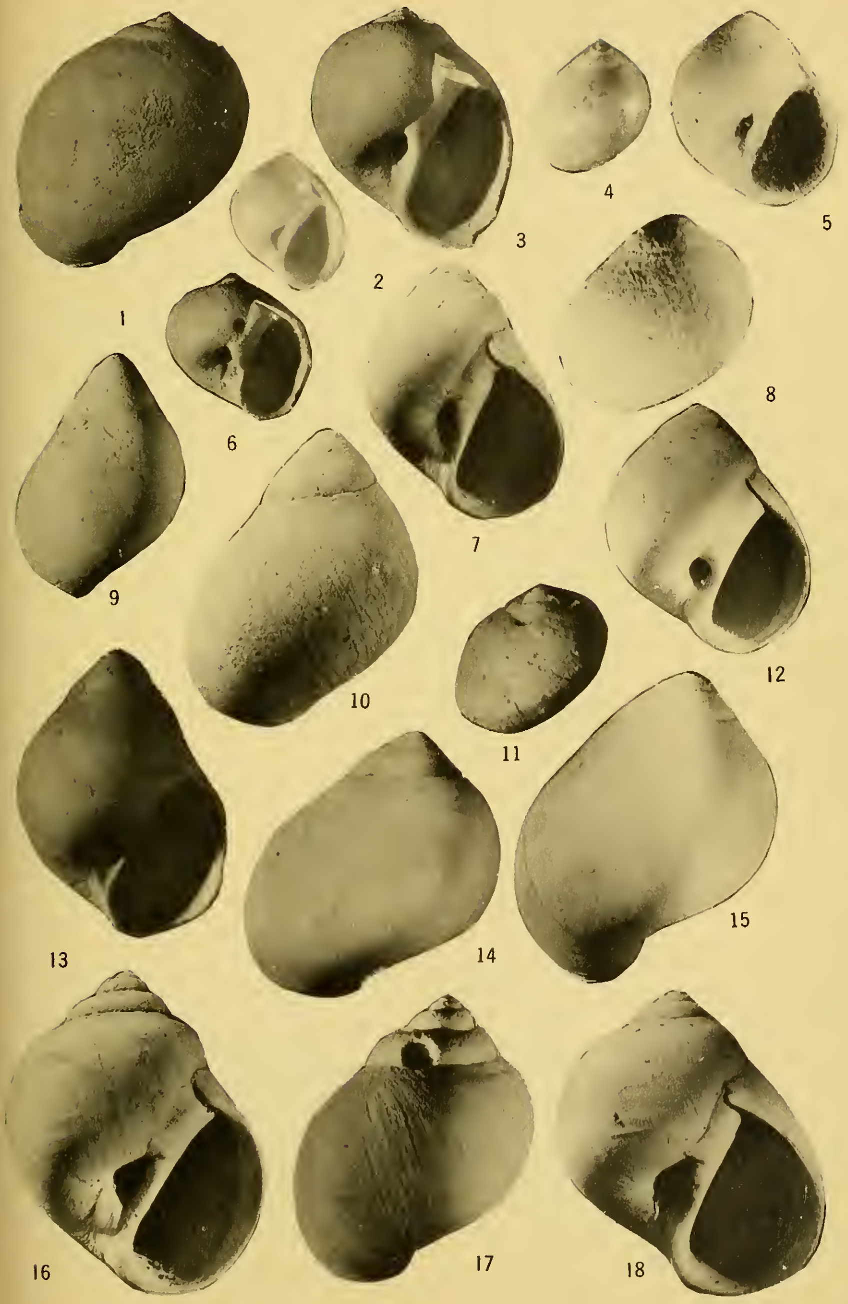

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

PLATE 13

Explanation of Plate 13

Figure		Page
1.	**Hipponix pygmæus** Lea	149
	No. 2790, P. R. I. L., 5 mm.; w., 4 mm.; h., 2 mm.	
	Gosport sand: Claiborne, Ala.	
2.	**Hipponix pygmæus** Lea	149
	No. 2791, P. R. I. L., 5 mm.; w., 4+ mm.; h., 1.5 mm.	
	Gosport sand: Claiborne, Ala.	
3.	**Hipponix pygmæus** Lea (**Helcion leanus** Gabb)	149
	No. 2792, P. R. I. L., 3.5 mm. (broken)	
	Lower Claiborne: loc. 725	

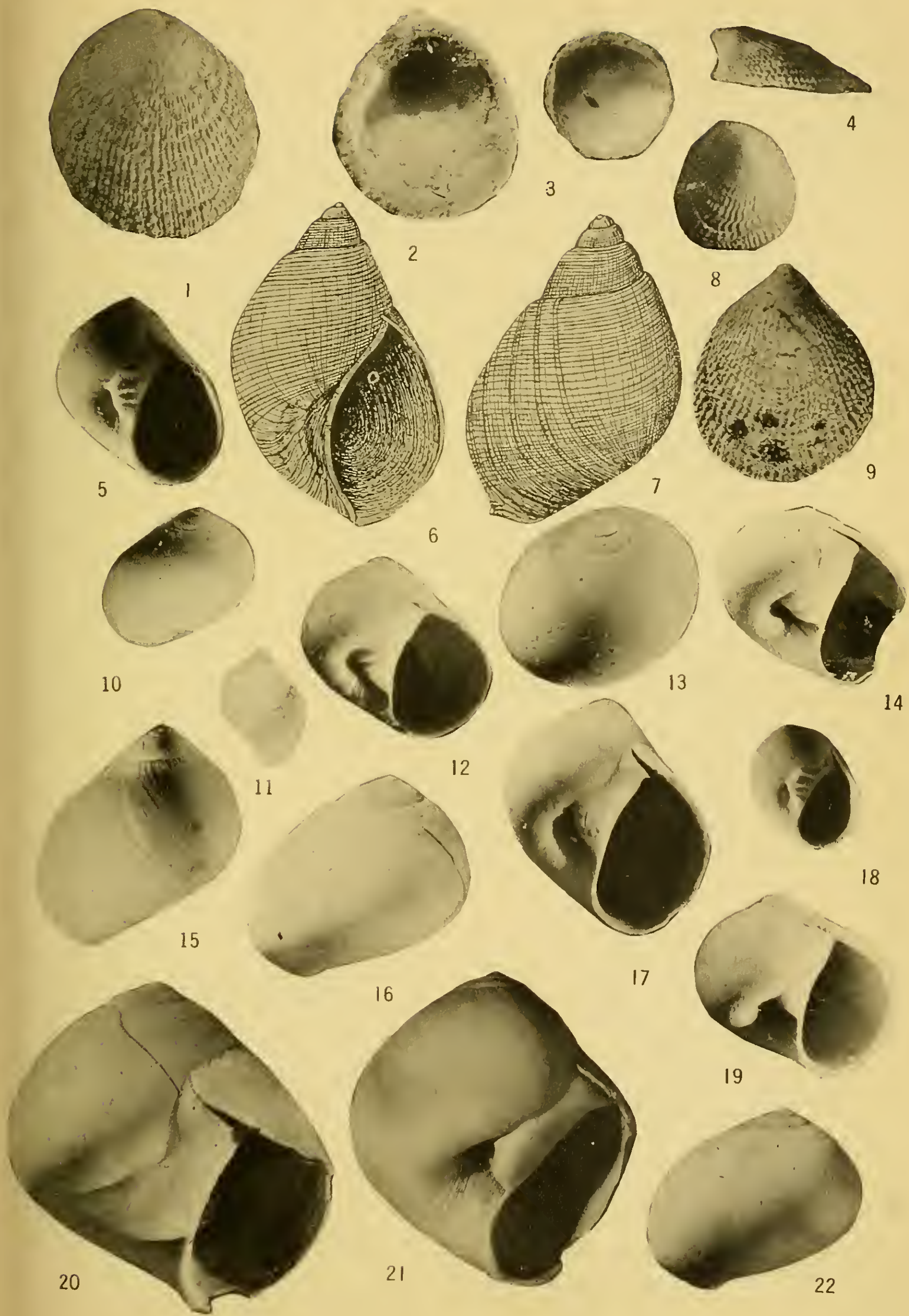

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

PLATE 14

EXPLANATION OF PLATE 14

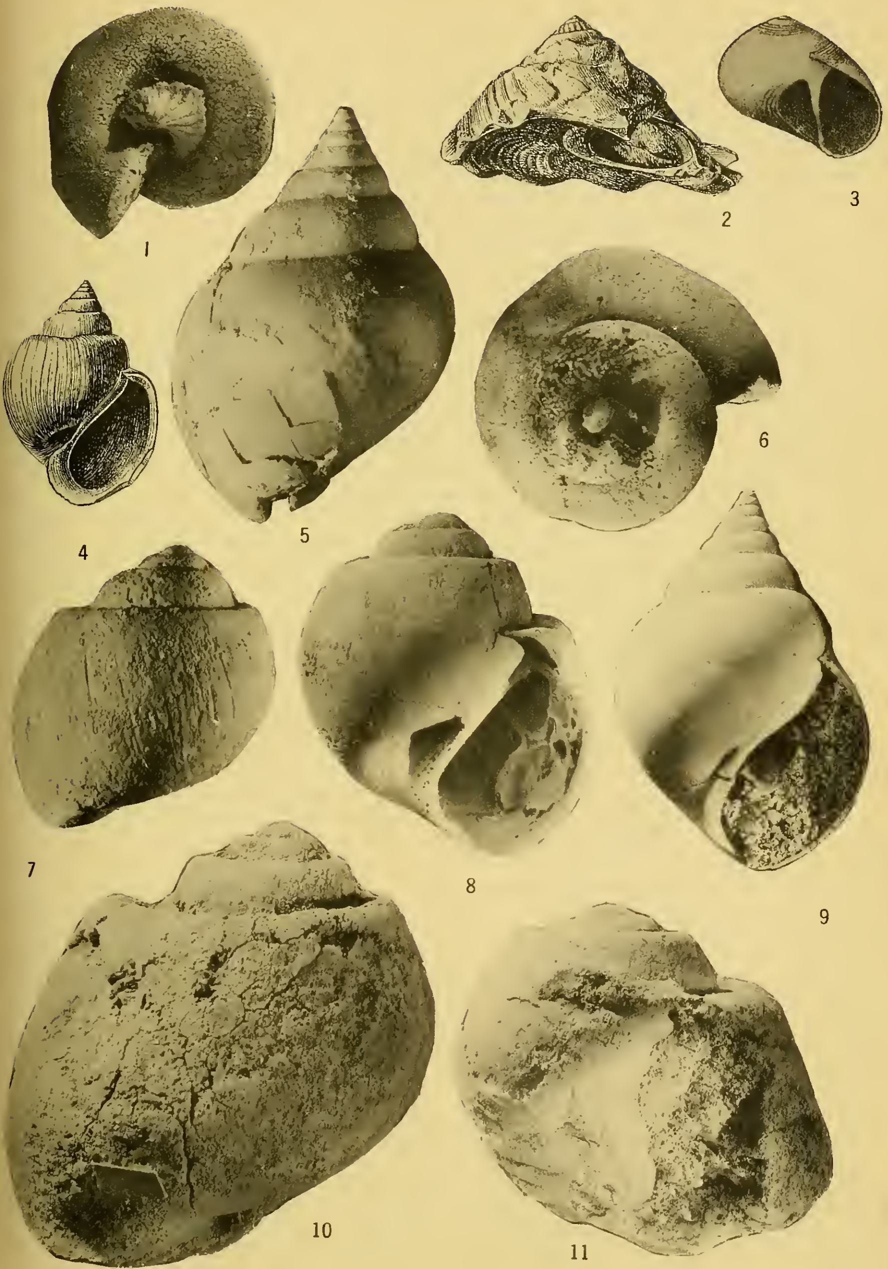

1
2
3
4
5
6
7
8
9
10
11

PLATE 15

EXPLANATION OF PLATE 15

Figure		Page
1.	**Sinum inconstans** (Meyer and Aldrich) No. 2808, P. R. I. H., 4 mm.; g. d., 8 mm. Lower Claiborne: loc. 728	141
2.	**Sinum beatricæ**, n. sp. No. 2811, P. R. I., holotype H., 8 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	141
3.	**Sinum arctatum** (Conrad) No. 2813, P. R. I. H., 10 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	141
4.	**Sinum beatricæ**, n. sp. Same specimen as fig. 2	141
5.	**Sinum declive** (Conrad) No. 2815, P. R. I. H., 10 mm.; g. d., 10 mm. Lower Claiborne: loc. 733	140
6.	**Sinum declive** (Conrad) No. 2816, P. R. I. H., 12 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	140
7.	**Sinum inconstans** (Meyer and Aldrich) No. 2809, P. R. I. H., 5 mm.; g. d., 9 mm. Lower Claiborne: loc. 723	141
8.	**Sinum inconstans** (Meyer and Aldrich) No. 2810, P. R. I. H., 6 mm.; g. d., 10.5 mm. Lower Claiborne: loc. 723	141
9.	**Sinum arctatum** (Conrad) Same specimen as fig. 3	141
10.	**Sinum beatricæ**, n. sp. No. 2814, P. R. I., paratype. H., 6 mm.; g. d., 10 mm. Lower Claiborne: loc. 731	141
11.	**Sinum declive** (Conrad) Same specimen as fig. 6	140
12.	**Sinum inconstans** (Meyer and Aldrich) Same specimen as fig. 7	141
13.	**Sinum arctatum** (Conrad) No. 2814, P. R. I. H., 8 mm.; g. d., 10 mm. Lower Claiborne: loc. 723	141
14.	**Sinum arctatum** (Conrad) Same specimen as fig. 13	141
15.	**Sinum declive** (Conrad) Same specimen as fig. 5	140
16.	**Sinum declive** (Conrad) No. 2817, P. R. I. H., 10 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	140
17.	**Sinum bilix** (Conrad) No. 2818, P. R. I. H., 17 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	139
18.	**Sinum ? bilix** (Conrad) No. 2819, P. R. I. H., 11 mm.; g. d., 11 mm. (broken) Oligocene: Vicksburg, Miss.	139
19.	**Sinum bilix** (Conrad) Same specimen as fig. 17	139
20.	**Sinum bilix** (Conrad) No. 2820, P. R. I. H., 8 mm.; g. d., 7 mm. Gosport sand: Claiborne, Ala.	139

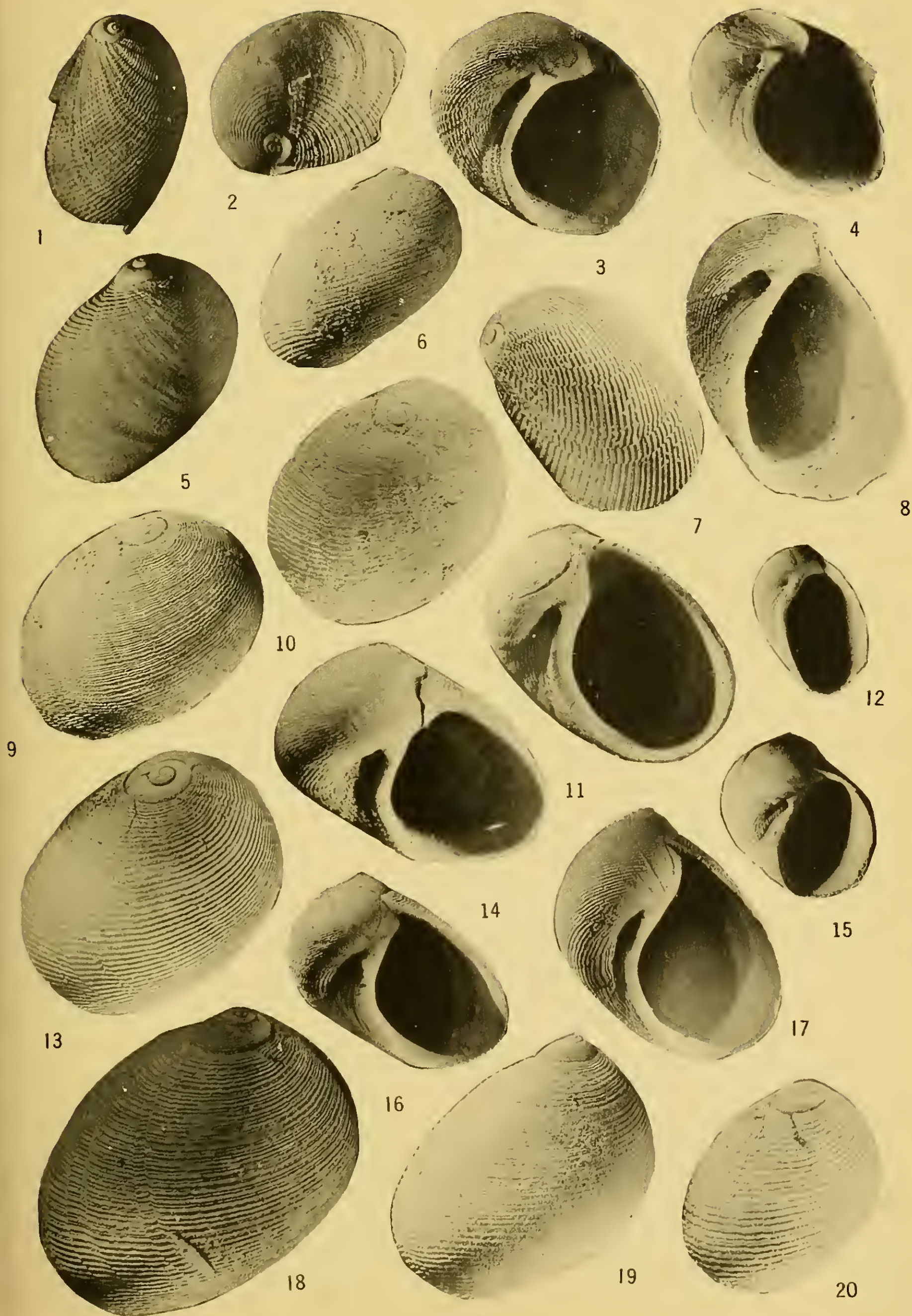

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

PLATE 16

EXPLANATION OF PLATE 16

Figure		Page
1.	**Calyptræa aperta** (Solander) No. 2821, P. R. I. H., 14 mm.; g. d., 18 mm. Gosport sand: Claiborne, Ala.	145
2.	**Calyptræa aperta** (Solander) No. 2822, P. R. I. H., 18 mm.; g. d., 20 mm. Gosport sand: Claiborne, Ala.	145
3.	**Calyptræa aperta** (Solander) No. 2823, P. R. I. H., 25 mm.; g. d., 39 mm. Gosport sand: Claiborne, Ala.	145
4.	**Crepidula dumosa** Conrad Holotype A. N. S. G. d., 22 mm.	148
5.	**Calyptræa aperta** (Solander) No. 2824, P. R. I. H., 12 mm.; g. d., 22 mm. Gosport sand: Claiborne, Ala.	145
6.	**Crepidula dumosa** Conrad No. 2825, P. R. I. H., 15 mm.; g. d., 30 mm. Lower Claiborne: loc. 707	148
7.	**Crepidula dumosa** Conrad No. 2826, P. R. I. H., 15 mm.; g. d., 30 mm. Clairbornian: loc. 136	148
8.	**Crepidula lirata** Conrad No. 2828, P. R. I. H., 18 mm.; g. d., 25 mm. Gosport sand: Claiborne, Ala.	146
9.	**Crepidula dumosa** Conrad Same specimen as fig. 7	148
10.	**Crepidula dumosa** Conrad No. 2827, P. R. I. H., 8 mm.; g. d., 19 mm. Young Lower Claiborne: loc. 707	148
11.	**Crepidula lirata** Conrad No. 2829, P. R. I. H., 23 mm.; g. d., 36 mm. Gosport sand: Claiborne, Ala.	146
12.	**Crepidula lirata** Conrad No. 2830, P. R. I. H., 10 mm.; g. d., 24 mm. Gosport sand: Claiborne, Ala.	146
13.	**Crepidula lirata** Conrad No. 2831, P. R. I. H., 24 mm.; g. d., 38 mm. Gosport sand: Claiborne, Ala.	146
14.	**Crepidula lirata** Conrad Same specimen as fig. 13	146


1
2
3
4
5
6
7
9
10
8
12
11
13
14

PLATE 17

Explanation of Plate 17

Figure		Page
1.	**"Alaba" plicato-varicosa** (Heiiprin) Copy Heilprin	152
2.	**Architectonica Johnsoni** (Dall) No. 2832, P. R. I. H., 4 mm.; g. d., 8 mm. Gosport sand: Claiborne, Ala.	162

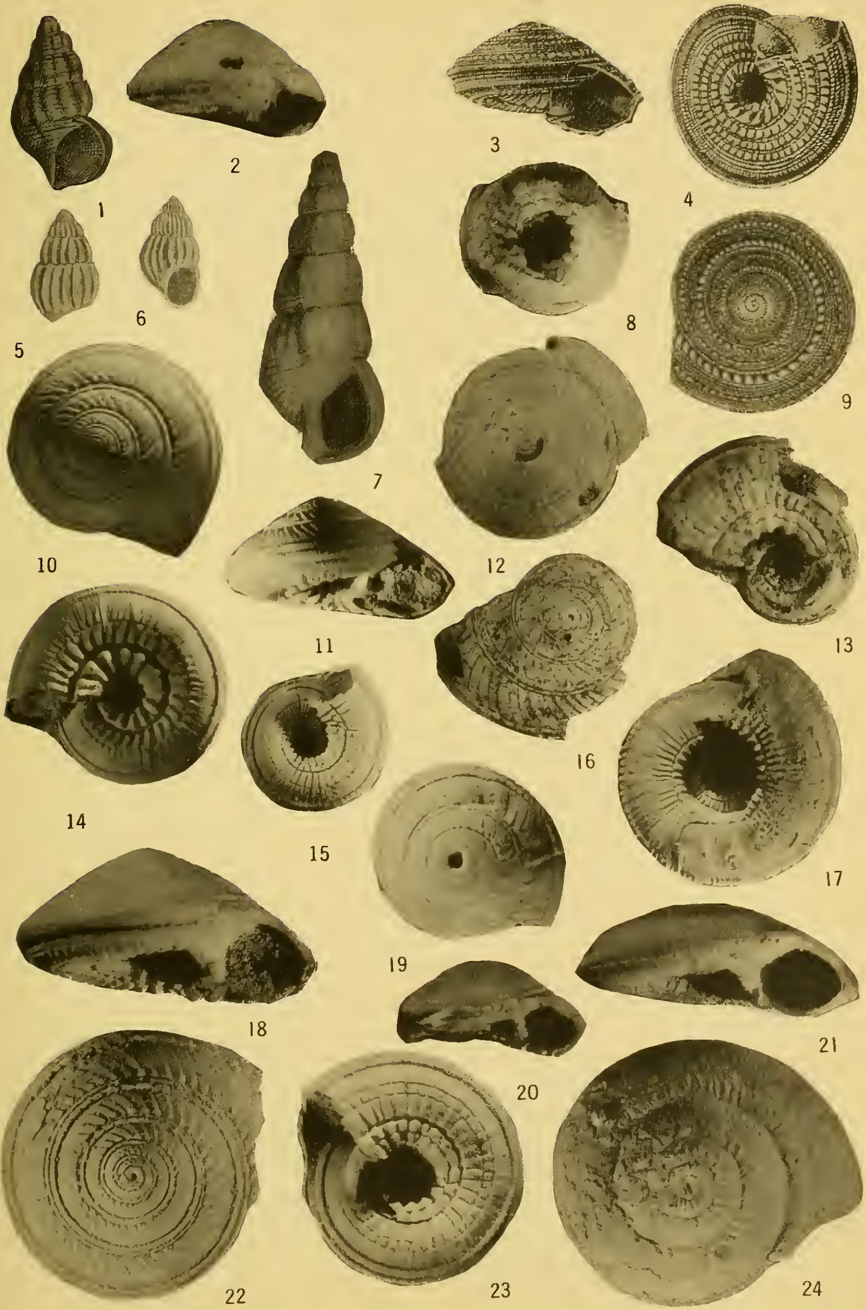

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

PLATE 18

EXPLANATION OF PLATE 18

Figure		Page
1.	**Architectonica Aldrichi** (Dall) No. 2837, P. R. I. H., 5 mm.; g. d, 9 mm. Lower Claiborne: loc. 731	169
2.	**Architectonica Aldrichi** (Dall) Same specimen as figs. 1, 6	169
3.	**Architectonica Cossmanni** (Dall) Copy Dall	166
4.	**Architectonica vespertina** Gabb No. 2838, P. R. I. H., 4 mm.; g. d., 10 mm. Lower Claiborne: loc. 725	168
5.	**Architectonica vespertina** Gabb Same specimen as fig. 4	168
6.	**Architectonica Aldrichi** (Dall) Same specimen as figs. 1, 2	169
7.	**Architectonica Aldrichi** (Dall) Copy Dall	169
8.	**Architectonica Cossmanni** (Dall) Copy Dall	166
9.	**Architectonica Aldrichi** (Dall) Copy Dall	169
10.	**Architectonica elaborata** (Conrad) **Solarium striato-granulatum** Heilprin type Amer. Mus. Nat. Hist.	164
11.	**Architectonica elaborata** (Conrad) **Solarium striato-granulatum** Heilprin type Amer. Mus. Nat. Hist.	164
12.	**Architectonica elaborata** (Conrad) **Solarium striato-granulatum** Heilprin type Amer. Mus. Nat. Hist.	164
13.	**Architectonica elaborata** (Conrad) No. 2839, P. R. I. H., 7 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	164
14.	**Architectonica elaborata** (Conrad) No. 2840, P. R. I. H., 11 mm.; g. d., 20 mm. Gosport sand: Claiborne, Ala.	164
15.	**Architectonica elaborata** (Conrad) No. 2841, P. R. I. H., 4 mm.; g. d., 7 mm. Gosport sand: Claiborne, Ala.	164
16.	**Architectonica elaborata** (Conrad) Same specimen as figs. 15, 19	164
17.	**Architectonica elaborata** (Conrad) Same specimen as figs. 14, 18	164
18.	**Architectonica elaborata** (Conrad) Same specimen as figs. 14, 17	164
19.	**Architectonica elaborata** (Conrad) Same specimen as figs. 15, 16	164

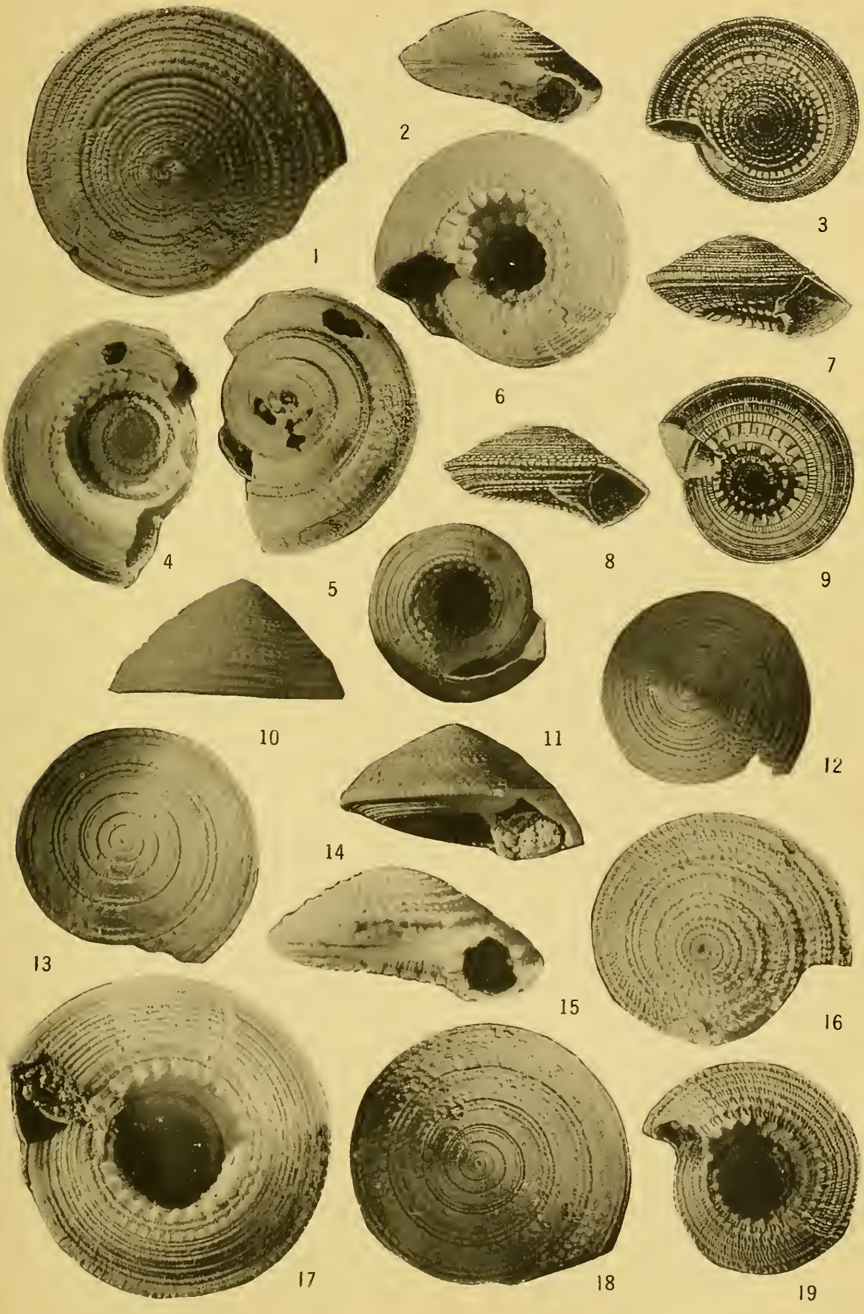

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

PLATE 19

EXPLANATION OF PLATE 19

Figure		Page
1.	**Architectonica scrobiculata** (Conrad) No. 2842, P. R. I. H., 6 mm.; g. d., 12 mm. Gosport sand: Claiborne, Ala.	171
2.	**Architectonica scrobiculata** (Conrad) No. 2843, P. R. I. H., 3 mm.; g. d., 10 mm. Lower Claiborne: loc. 728	171
3.	**Architectonica scrobiculata** (Conrad) Same specimen as fig. 2	171
4.	**Architectonica scrobiculata** (Conrad) Same specimen as fig. 1	171
5.	**Architectonica scrobiculata hicoria**, n. var. No. 2844, P. R. I., holotype. H., 2.5 mm.; g. d., 8 mm. Lower Claiborne: loc. 728	172
6.	**Architectonica scrobiculata hicoria**, n. var. Same specimen as figs. 5, 7	172
7.	**Architectonica scrobiculata hicoria**, n. var. Same specimen as figs. 5, 6	172
8.	**Architectonica alveata** (Conrad) No. 2845, P. R. I. H., 6 mm.; g. d., 13 mm. Gosport sand: Claiborne, Ala.	173
9.	**Architectonica alveata** (Conrad) Same specimen as figs. 8, 12	173
10.	**Architectonica alveata** (Conrad) No. 2846, P. R. I. H., 1.05 mm.; g. d., 3 mm. Young Lower Claiborne: loc. 741	173
11.	**Architectonica alveata** (Conrad) No. 2847, P. R. I. H., 11 mm.; g. d., 21 mm. Gosport sand: Claiborne, Ala.	173
12.	**Architectonica alveata** (Conrad) Same specimen as figs. 8, 9	173
13.	**Architectonica alveata** (Conrad) No. 2848, P. R. I. 9 mm. radius of fragment Gosport sand: Claiborne, Ala.	173
14.	**Architectonica alveata** (Conrad) No. 2849, P. R. I. H., 9 mm.; g. d., 20 mm. Lower Claiborne: loc. 733	173
15.	**Architectonica alveata** (Conrad) 2850, P. R. I. H., 1.50 mm.; g. d., 4 mm. Young Lower Claiborne: loc. 741	173
16.	**Architectonica alveata** (Conrad) No. 2851, P. R. I. H., 9 mm.; g. d., 17 mm. Gosport sand: Claiborne, Ala.	173
17.	**Architectonica alveata** (Conrad) Same specimen at figs. 14, 18	173
18.	**Architectonica alveata** (Conrad) Same specimen as figs. 14, 17	173

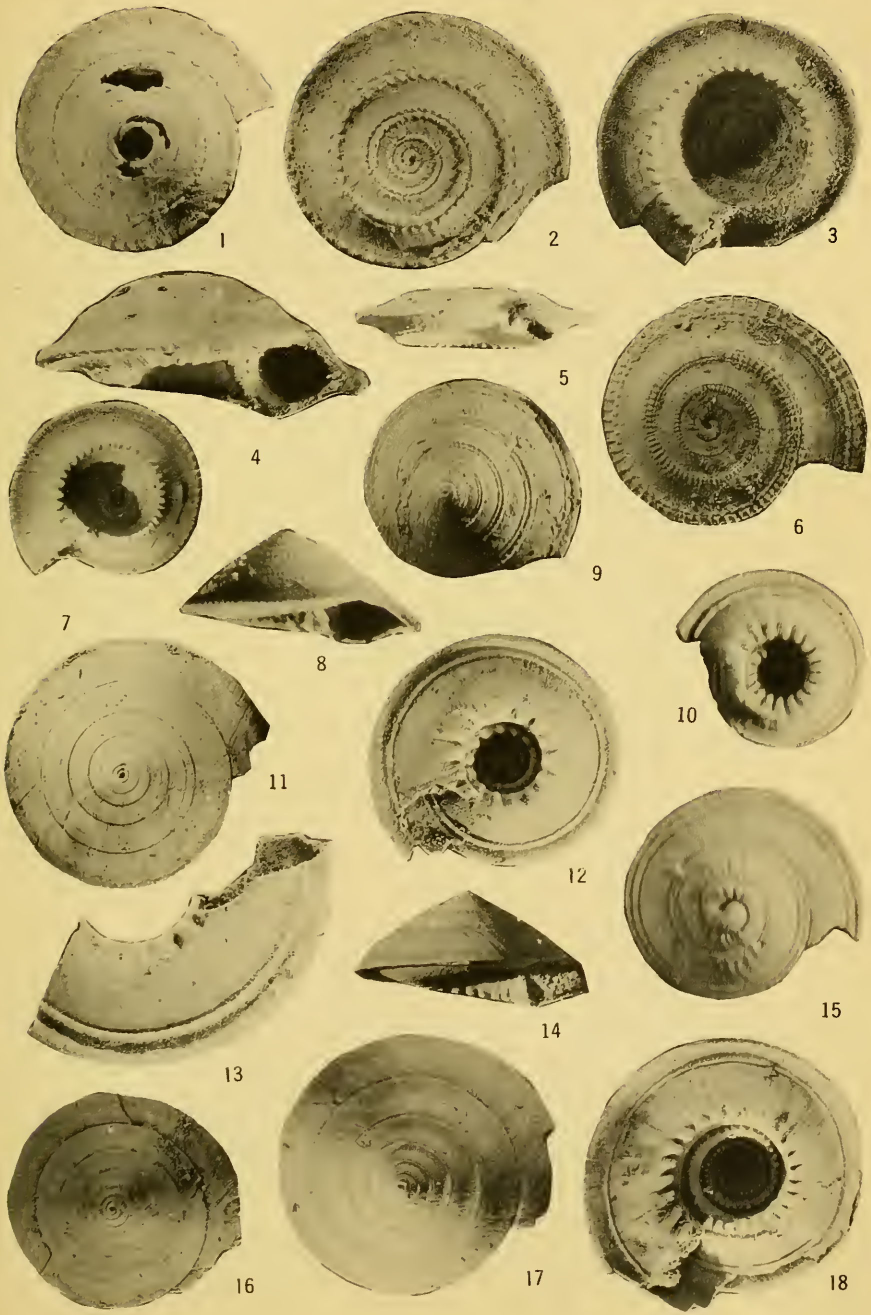

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

PLATE 20

EXPLANATION OF PLATE 20

Figure		Page
1.	**Architectonica huppertzi** (Harris) McConnell drawing holotype	166
2.	**Architectonica leana** (Dall) No. 2853, P. R. I. H., 5 mm.; g. d., 10 mm. Lower Claiborne: loc. 731	170
3.	**Architectonica leana** (Dall) Same specimen as fig. 2	170
4.	**Architectonica huppertzi** (Harris) McConnell drawing holotype	166
5.	**"Architectonica" bastropensis** (Harris) McConnell drawing holotype	174
6.	**Architectonica leana** (Dall) U. S. Nat. Mus. No. 113512, holotype.	170
7.	**"Architectonica" bastropensis** (Harris) McConnell drawing holotype	174
8.	**Architectonica leana** (Dall) U. S. Nat. Mus. No. 113512, holotype	170
9.	**Architectonica acuta meekiana** Gabb No. 2853, P. R. I. H., 5 mm.; g. d., 8 mm. Lower Claiborne: loc. 733	168
10.	**Architectonica leana** (Dall) Same specimen as figs. 2, 3	170
11.	**Architectonica acuta meekiana** Gabb Same specimen as figs. 9, 13	168
12.	**Architectonica acuta** Conrad No. 2854, P. R. I. H., 4 mm.; g. d., 10 mm. Lower Claiborne: locality 725	167
13.	**Architectonica acuta meekiana** Gabb Same specimen as figs. 9, 11	168
14.	**Architectonica acuta** Conrad No. 2855, P. R. I. H., .9 mm.; g. d., 3 mm. embryonic Lower Claiborne: loc. 741	167
15.	**Architectonica acuta** Conrad No. 2856, P. R. I. H., 6 mm.; g. d., 15 mm. Lower Claiborne: loc. 725	167
16.	**Architectonica acuta** Conrad Same specimen as figs. 15, 17	167
17.	**Architectonica acuta** Conrad Same specimen as figs. 15, 16	167

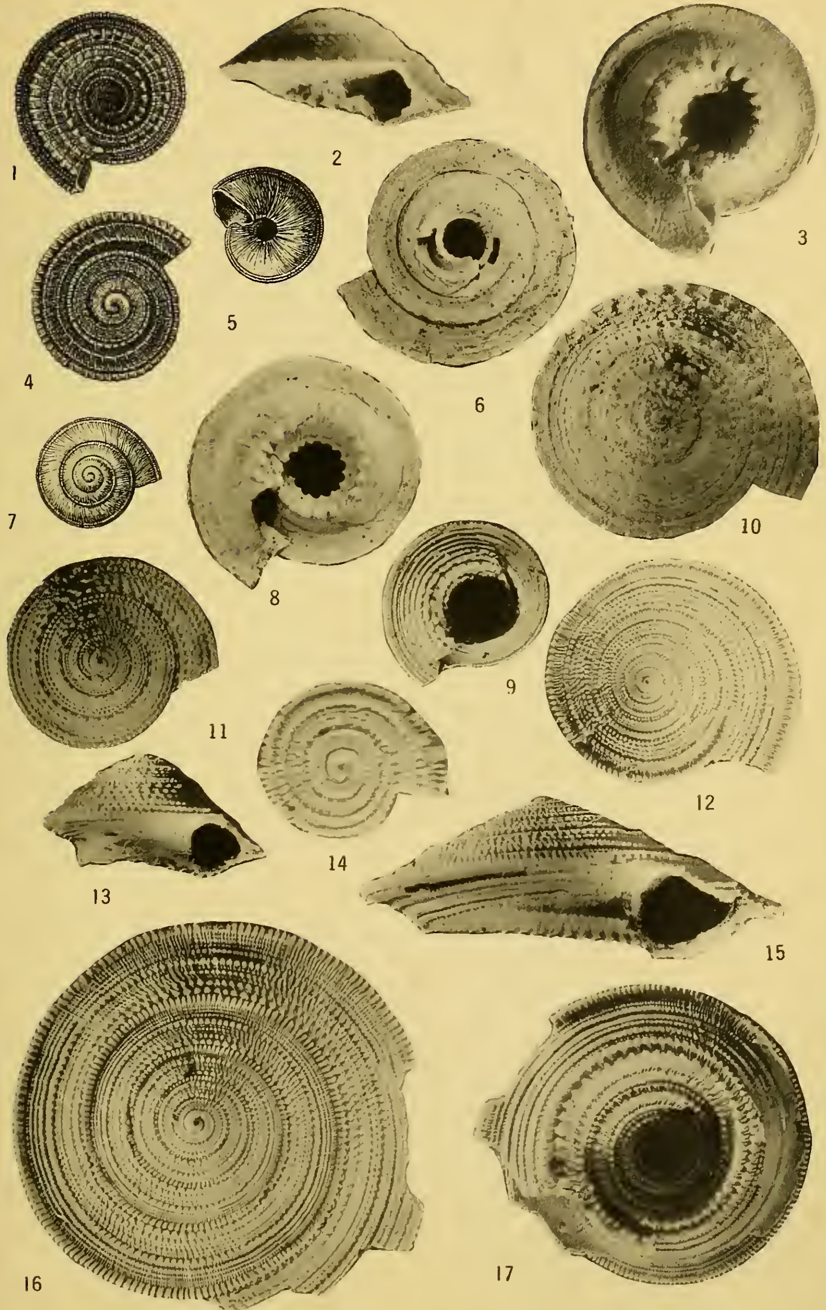

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

PLATE 21

EXPLANATION OF PLATE 21

Figure		Page
1.	**Skenea pignus** (de Gregorio) Copy De Gregorio	179
2.	**Skenea pignus** (de Gregorio) Copy De Gregorio	179
3.	**Omalaxis Singleyi** Aldrich Harris drawing	175

4. **Pseudomalaxis texana** (Aldrich) ---- 178
Copy Aldrich. "Length and breadth about 3 mm."
5. **Skenea pignus** (de Gregorio) ---- 179
Copy De Gregorio
6. **Pseudomalaxis texana** (Aldrich) ---- 178
Copy Aldrich. "Length and breadth about 3 mm.'
7. **Omalaxis singleyi** Aldrich ---- 175
Harris drawing
8. **Pseudomalaxis rotella** (Lea) ---- 176
Copy Lea
9. **Pseudomalaxis plummeræ, n. sp.** ---- 178
No. 2857, P. R. I., holotype. H., .45 mm.; g. d., 1.45 mm.
Lower Claiborne: loc. 723
10. **"Adeorbis" incertus** de Gregorio ---- 180
Copy De Gregorio
11. **"Pseudomalaxis" tipa** (de Gregorio) ---- 178
Copy De Gregorio
12. **"Pseudomalaxis" tipa** (de Gregorio) ---- 178
Copy De Gregorio
13. **Pseudomalaxis rotella** (Lea) ---- 176
Copy Lea
14. **Pseudomalaxis plummeræ, n. sp.** ---- 178
No. 2858, P. R. I., paraytpe. H., .35 mm.; g. d., 1.20 mm.
Lower Claiborne: loc. 723
15. **Pseudomalaxis plummeræ, n. sp.** ---- 178
No. 2859, P. R. I., paratype. H., .35 mm.; g. d., 1.10 mm.
Lower Claiborne: loc. 723
16. **Texania texana** (Heilprin) ---- 182
Copy Heilprin
17. **Bayania claibornensis** (Heilprin) ---- 184
Copy Heilprin
18. **"Bayania" secale** (Lea) ---- 184
No. 2863, P. R. I. H., 6 mm.; g. d., 2 mm.
Gosport sand: Claiborne, Ala.
19. **"Bayania" secale** (Lea) ---- 184
Same specimen as fig. 18
20. **"Bayania" secale** (Lea) ---- 184
No. 2864, P. R. I. H., 9 mm.; g. d., 3.5 mm.
Gosport sand: Claiborne, Ala.
21. **Texania texana** (Heilprin) ---- 182
No. 2860, P. R. I. H., 40 mm.; g. d., 20 mm.
Lower Claiborne: loc. 138
22. **Texania texana** (Heilprin) ---- 182
No. 2861, P. R. I. H., 62 mm.; g. d., 28 mm.
Lower Claiborne: loc. 766
23. **Texania texana** (Heilprin) ---- 182
No. 2862, P. R. I. H., 38 mm.; g. d., 19 mm.
Lower Claiborne: loc. 727
24. **"Bayania" secale** (Lea) ---- 184
No. 2865, P. R. I. H., 8.5 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.

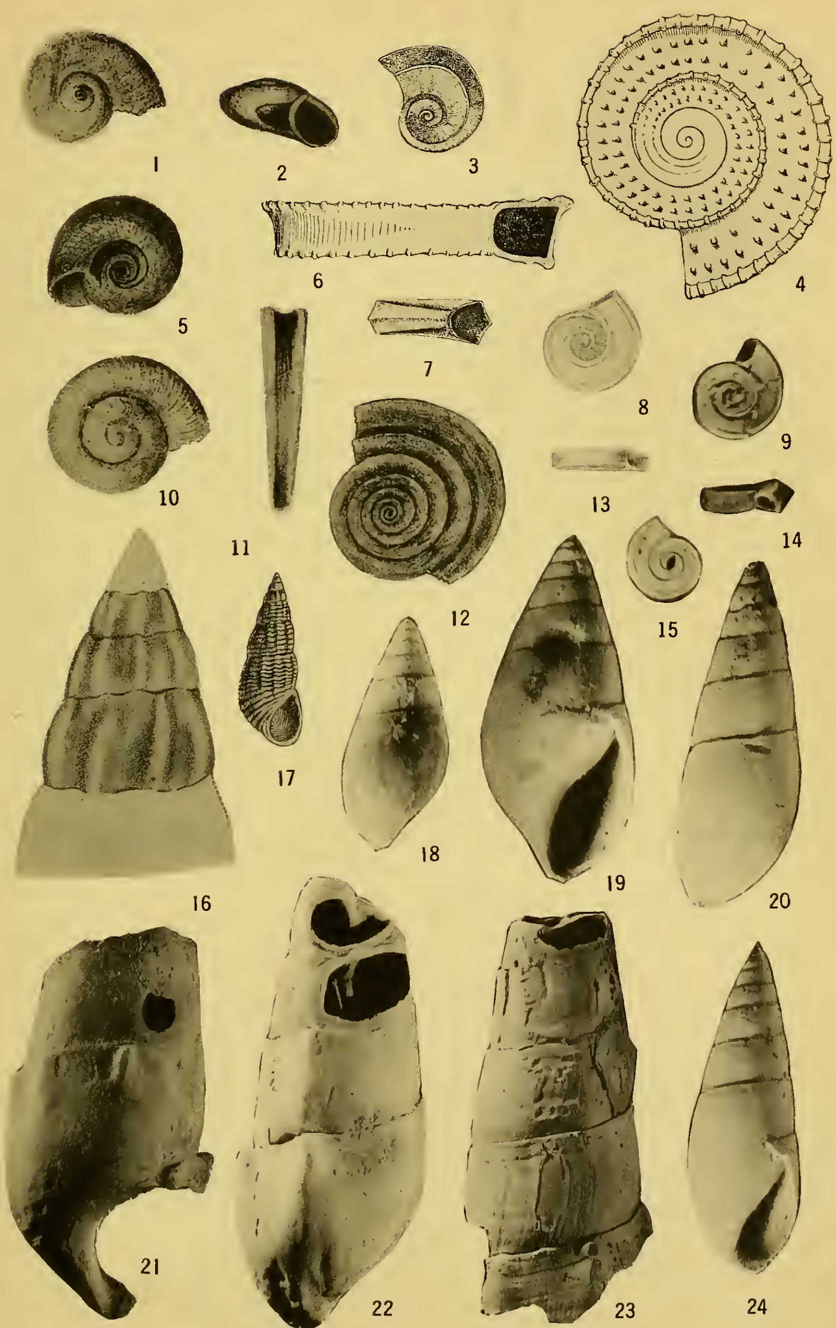

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

PLATE 22

EXPLANATION OF PLATE 22

Figure		Page
1.	**Turritella rina subrina**, n. var. No. 2866, P. R. I., syntype. H., 17 mm.; g. d., 15 mm. Lower Claiborne: loc. 734	194
2.	**Turritella rina subrina**, n. var. No. 2867, P. R. I , syntype. H., 10 mm.; g. d., 10 mm. Lower Claiborne: loc. 734	194
3.	**Turritella rina**, n. sp. No. 2868, P. R. I., paratype. H., 25 mm.; g. d., 10 mm. Lower Claiborne: loc. 803	192
4.	**Turritella rina**, n. sp. No. 2869, P. R. I., paratype. H., 14 mm.; g. d., 5 mm. Lower Claiborne: loc. 725	192
5.	**Turritella rina subrina**, n. var. No. 2870, P. R. I., syntype. H., 68 mm.; g. d., 22 mm. Lower Claiborne: loc. 103	194
6.	**Turritella rina carolina**, n. var. No. 2872, P. R. I., holotype. H., 50 mm.; g. d., 16 mm. Lower Claiborne: loc. 707	194
7.	**Turritella rina subrina**, n. var. No. 2873, P. R. I., syntype. Lost	194
8.	**Turritella rina subrina**, n. var. No. 2871, P. R. I., syntype. H., 9 mm.; g. d., 4 mm., apical portion of fig. 10. Lower Claiborne: loc. 103	194
9.	**Turritella rina**, n. sp. No. 2874, P. R. I., holotype. H., 47 mm.; g. d., 18 mm. Lower Claiborne: loc. 103	192
10.	**Turritella rina subrina**, n. var. No. 2871, P. R. I. H., 33 mm.; g. d., 12 mm. Additional whorls to fig. 8	194
11.	**Turritella rina subrina**, n. var. No. 2875, P. R. I., syntype. H., 41 mm.; g. d., 14 mm. Lower Claiborne: loc. 103	194


1
2
3
4
5
6
7
8
9
10
11

PLATE 23

EXPLANATION OF PLATE 23


1
2
3
4
5
6
7
8
9
10
11

PLATE 24

EXPLANATION OF PLATE 24

Figure		Page
1.	**Turritella apita** de Gregorio No. 2884, P. R. I. H., 6 mm.; g. d., 2 mm. Gosport sand: Claiborne, Ala.	195
2.	**Turritella ghigna** de Gregorio No. 2888, P. R. I. H., 9 mm.; g. d., 4 mm. Gosport sand: Claiborne, Ala.	191
3.	**Turritella apita** de Gregorio No. 2885, P. R. I. H., 11 mm.; g. d., 4 mm. Gosport sand: Claiborne, Ala.	195
4.	**Turritella ghigna** de Gregorio No. 2889, P. R. I. H., 22 mm.; g. d., 11 mm. Gosport sand: Claiborne, Ala.	191
5.	**Turritella carinata** Lea No. 2894, P. R. I. H., 20 mm.; g. d., 4 mm. Gosport sand: Claiborne, Ala.	189
6.	**Turritella carinata** Lea No. 2895, P. R. I. H., 35 mm.; g. d., 11 mm. Gosport sand: Claiborne, Ala.	189
7.	**Turritella apita** de Gregorio No. 2886, P. R. I. H., 19 mm.; g. d., 9 mm. Gosport sand: Claiborne, Ala.	195
8.	**Turritella carinata** Lea No. 2896, P. R. I. H., 41 mm.; g d, 11 mm. Gosport sand: Claiborne, Ala.	189
9.	**Turritella carinata** Lea No. 2897, P. R. I. H., 41 mm.; g. d., 12 mm. Gosport sand: Claiborne, Ala.	189
10.	**Turritella apita** de Gregorio No. 2887, P. R. I. H., 26 mm.; g. d., 9 mm. Gosport sand: Claiborne, Ala.	195
11.	**Turritella ghigna** de Gregorio No. 2890, P. R. I. H., 32 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	191
12.	**Turritella carinata** Lea No. 2898, P. R. I. H., 36 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	189
13.	**Turritella ghigna** de Gregorio No. 2891, P. R. I. H., 30 mm.; g. d., 20 mm. Gosport sand: Claiborne, Ala.	191
14.	**Turritella mortoni** Conrad No. 2892, P. R. I. H., 49 m.; g. d., 18 mm. Top layer Ratcliff Wharf, Va. Aquia Eocene (Not fig. 13 as stated, p. 195, this report)	195
15.	**Turritella ghigna** de Gregorio No. 2893, P. R. I. H., 48 mm.; g. d., 18 mm. Gosport sand: Claiborne, Ala.	191

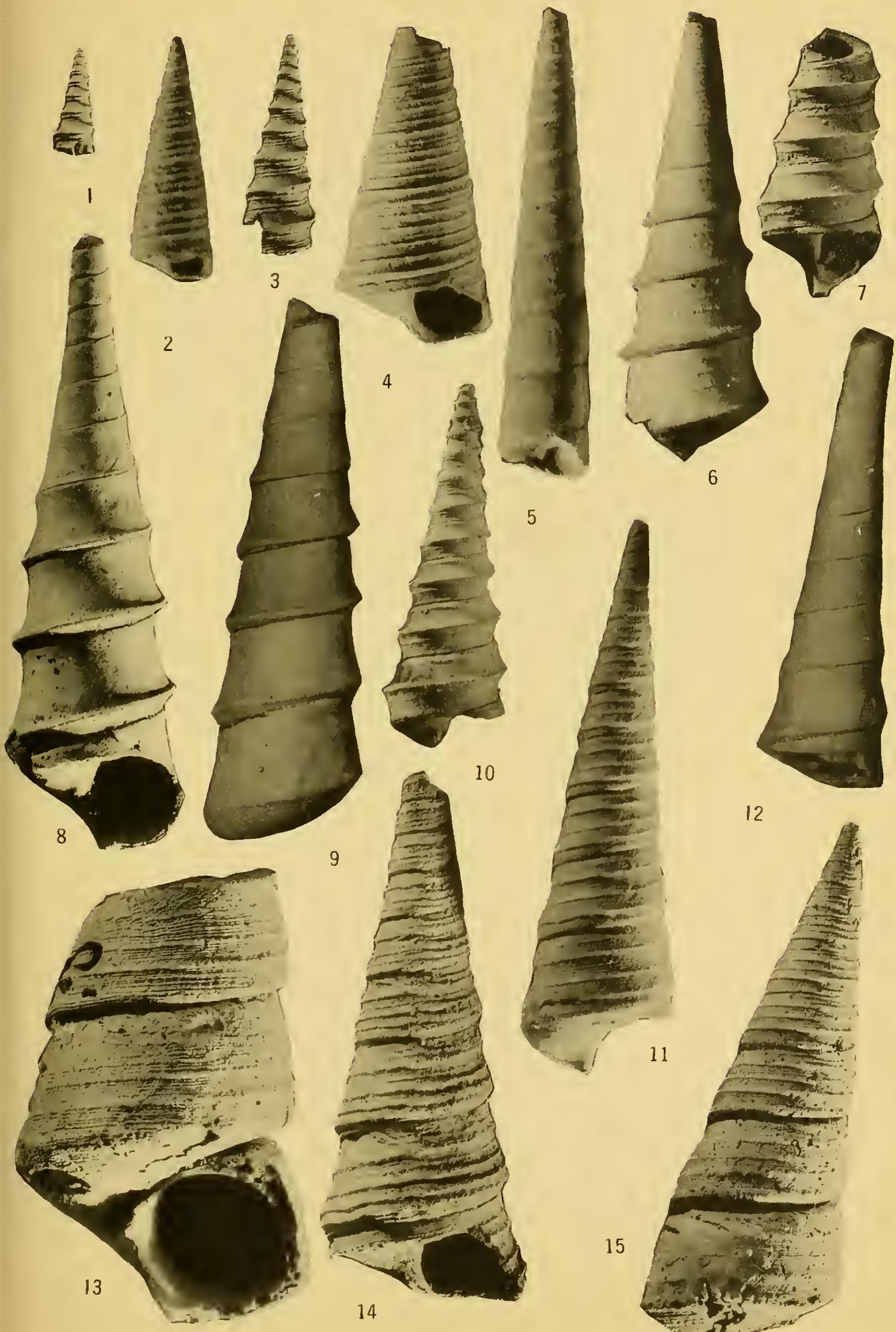

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

PLATE 25

Explanation of Plate 25

Figure		Page
1.	**Turritella nasuta** Gabb No. 2899, P. R. I. H., 20 mm.; g. d., 8 mm. Lower Claiborne: loc. 103	200
2.	**Turritella nasuta** Gabb No. 2900, P. R. I. H., 20 mm.; g. d., 8.5 mm. Lower Claiborne: loc. 103	200
3.	**Turritella nasuta** Gabb No. 2901, P. R. I. H., 36.5 mm.; g. d., 9 mm. Lower Claiborne: loc. 734	200
4.	**Turritella nasuta houstonia** Harris McConnell drawing, holotype Lower Claiborne: Alabama Bluff, Trinity River, Houston Co., Texas	201
5.	**Turritella nasuta** Gabb No. 2902, P. R. I. Lost Lower Claiborne: loc. 733	200
6.	**Turritella nasuta** Gabb No. 2903, P. R. I. H., 14 mm.; g. d., 3.5 mm. Lower Claiborne: loc. 733	200
7.	**Turritella nasuta houstonia** Harris No. 2907, P. R. I. H., 21 mm.; g. d., 5 mm. Lower Claiborne: loc. 723	201
8.	**Turritella nasuta** Gabb No. 2904, P. R. I. H., 35 mm.; g. d., 7 mm. Lower Claiborne: loc. 103	200
9.	**Turritella nasuta** Gabb No. 2905, P. R. I. H., 46 mm.; g. d., 33 mm. Lower Claiborne: loc. 734	200
10.	**Turritella nasuta** Gabb No. 2906, P. R. I. H., 62 mm.; g. d., 15 mm. Lower Claiborne: loc. 766	200
11.	**Turritella nasuta houstonia** Harris No. 2908, P. R. I. H., 22 mm.; g. d., 6 mm. Lower Claiborne: loc. 733	201

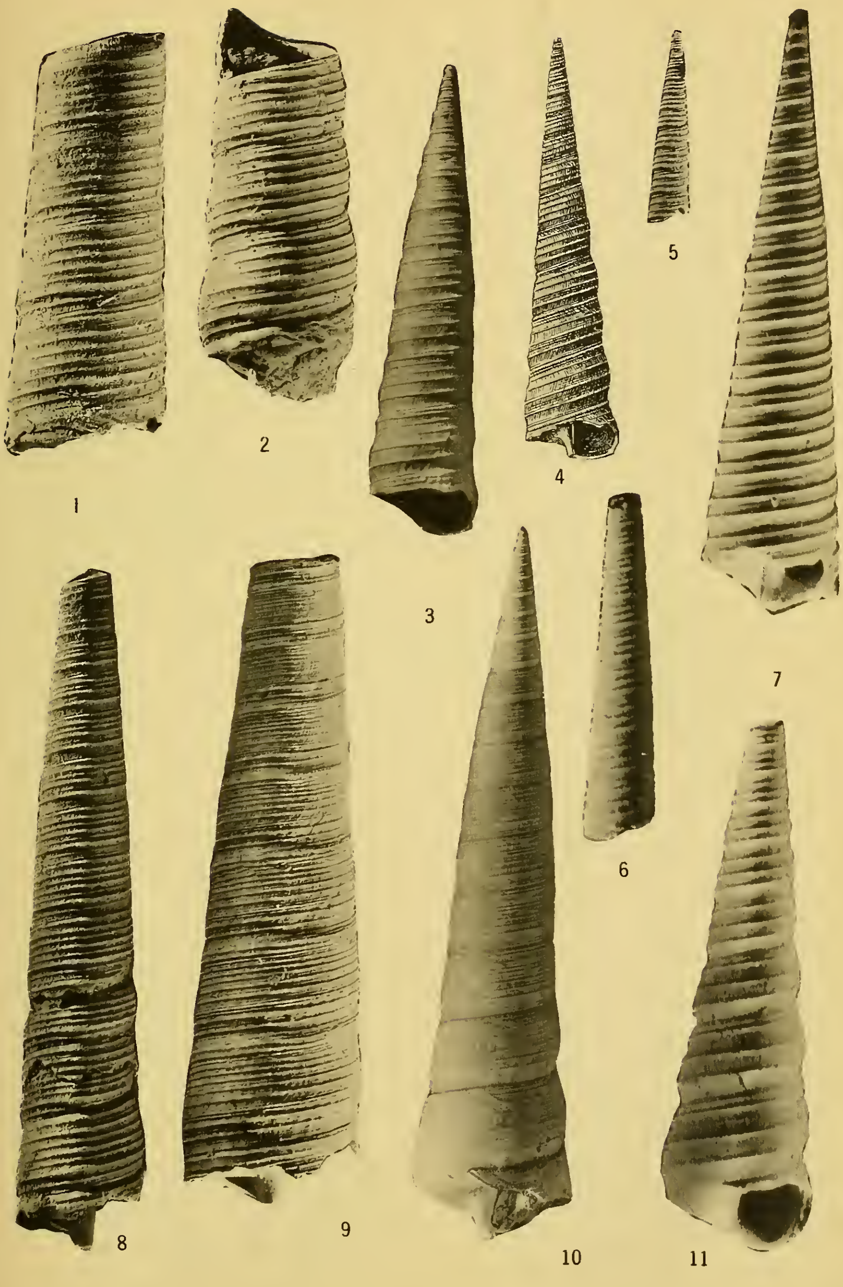

1
2
3
4
5
6
7
8
9
10
11

PLATE 26

EXPLANATION OF PLATE 26

Figure		Page
1.	**Turritella dutexata** Harris No. 2909, P. R. I. H., 11 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	198
2.	**Turritella dutexata** Harris No. 2910, P. R. I. H., 17 mm.; g. d., 9 mm. Lower Claiborne: loc. 731	198
3.	**Turritella dutexata** Harris McConnell drawing, holotype. H., 22 mm. Lower Claiborne: Lee Co., Texas	198
4.	**Turritella dutexata** Harris No. 2911, P. R. I. H., 12 mm.; g. d., 4 mm. Lower Claiborne: loc. 725	198
5.	**Turritella femina** Stenzel Copy Stenzel in Renick and Stenzel	203
6.	**Turritella clevelandica** Harris Copy Harris, 1894, holotype	202
7.	**Turritella clevelandica** Harris No. 2914, P. R. I. H., 17 mm.; g. d., 6 mm. White Bluff, Ark., Claibornian or Jacksonian	202
8.	**Turritella dutexata** Harris No. 2912, P. R. I. H., 26 mm.; g. d., 10 mm. Lower Claiborne: loc. 746	198
9.	**Turritella dutexata** Harris No. 2913, P. R. I. H., 17 mm.; g. d., 7 mm. Lower Claiborne: loc. 728	198
10.	**Turritella dumblei** Harris Univ. Texas specimen. H., 15 mm.; g. d., 5 mm. Lower Claiborne: Cedar Creek, southeast corner of Wheelock league, Robertson Co., Texas	202
11.	**Turritella dumblei** Harris McConnell drawing, holotype. H., 31 mm. Lower Claiborne: Moseley's Ferry, Brazos River, Burleson Co., Texas	202
12.	**Turritella obruta** Conrad No. 2915, P. R. I. H., 33 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	203
13.	**Turritella obruta** Conrad No. 2916, P. R. I. H., 25 mm.; g. d., 8 mm. Gosport sand: Claiborne, Ala.	203
14.	**Turritella obruta** Conrad No. 2917, P. R. I. H., 26 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	203
15.	**Turritella dumblei** Harris Univ. Texas specimen. H., 14 mm.; g. d., 5.5 mm.	202

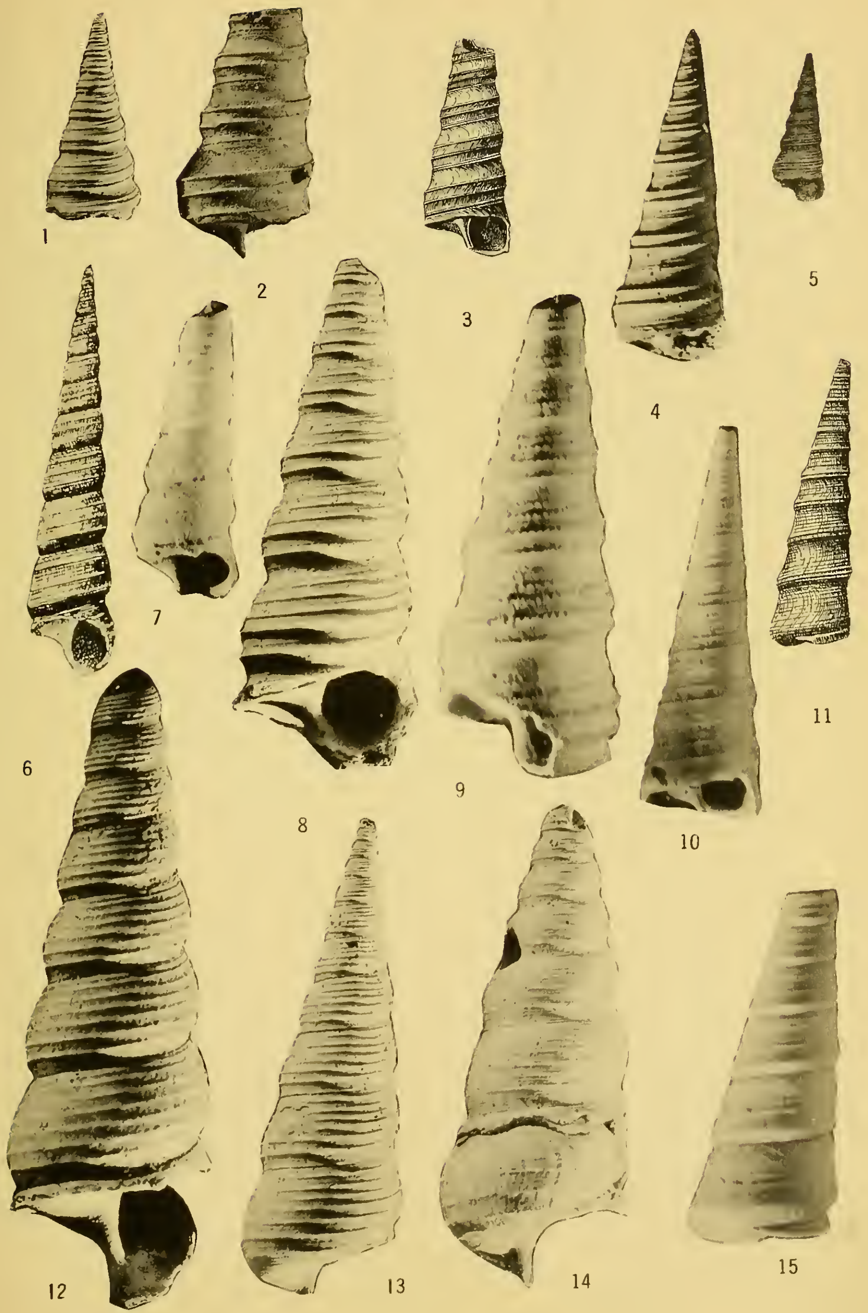

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

PLATE 27

EXPLANATION OF PLATE 27

Figure		Page
1.	**Bittium (Stylidium) elegans** (H. C. Lea) No. 351, P. R. I. Specimen figured Palmer, 1928. H., 7.5 mm.; g. d., 2.5 mm. Gosport sand: Claiborne, Ala.	219
2.	**Bittium (Stylidium) elegans** (H. C. Lea) No. 2928, P. R. I. Lost Gosport sand: Claiborne, Ala.	219
3.	**Bittium (Stylidium) henryleai** (Palmer) No. 355, P. R. I., paratype. H., 7 mm.; g. d., 2 mm. Lower Claiborne: loc. 776	220
4.	**Bittium (Stylidium) henryleai** (Palmer) No. 350, P. R. I., holotype. H., 7 mm.; g. d., 2 mm. Lower Claiborne: loc. 776	220
5.	**Mesalia pleboides** Vaughan No. 2918, P. R. I. H., 10 mm.; g. d., 4 mm. Lower Claiborne: loc. 730	208
6.	**Bittium (Stylidium) henryleai** (Palmer) No. 354, P. R. I., paratype. H., 5 mm.; g. d., 2 mm. Lower Claiborne, loc. 776	220
7.	**Mesalia vetusta** (Conrad) No. 2921, P. R. I. H., 18 mm.; g. d., 6 mm. Gosport sand: Claiborne, Ala.	205
8.	**Mesalia vetusta** (Conrad) No. 2922, P. R. I. H., 18 mm.; g. d., 6 mm. Gosport sand: Claiborne, Ala.	205
9.	**Mesalia claibornensis** Harris No. 2926, P. R. I. H., 23 mm.; g. d., 10 mm. Lower Claiborne: loc. 103	207
10.	**Mesalia claibornensis** Harris McConnell drawing, holotype. H., 37 mm. Lower Claiborne: Moseley's Ferry, Burleson Co., Texas	207
11.	**Mesalia pleboides** Vaughan No. 2919, P. R. I. H., 14 mm.; g. d., 5.5 mm. Lower Claiborne: loc. 771	208
12.	**Mesalia pleboides** Vaughan No. 2920, P. R. I. H., 13 mm.; g. d., 5.5 mm. Lower Claiborne: loc. 771	208
13.	**Mesalia vetusta** (Conrad) No. 2923, P. R. I. H., 33 mm.; g. d., 13 mm. Gosport sand: Claiborne, Ala.	205
14.	**Mesalia vetusta** (Conrad) No. 2924, P. R. I. H., 31 mm.; g. d., 10.5 mm. Gosport sand: Claiborne, Ala.	205
15.	**Mesalia vetusta** (Conrad) No. 2925, P. R. I. H., 33 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	205
16.	**Mesalia claibornensis** Harris No. 2927, P. R. I. H., 31 mm.; g. d., 10.5 mm. Lower Claiborne: loc. 734	207

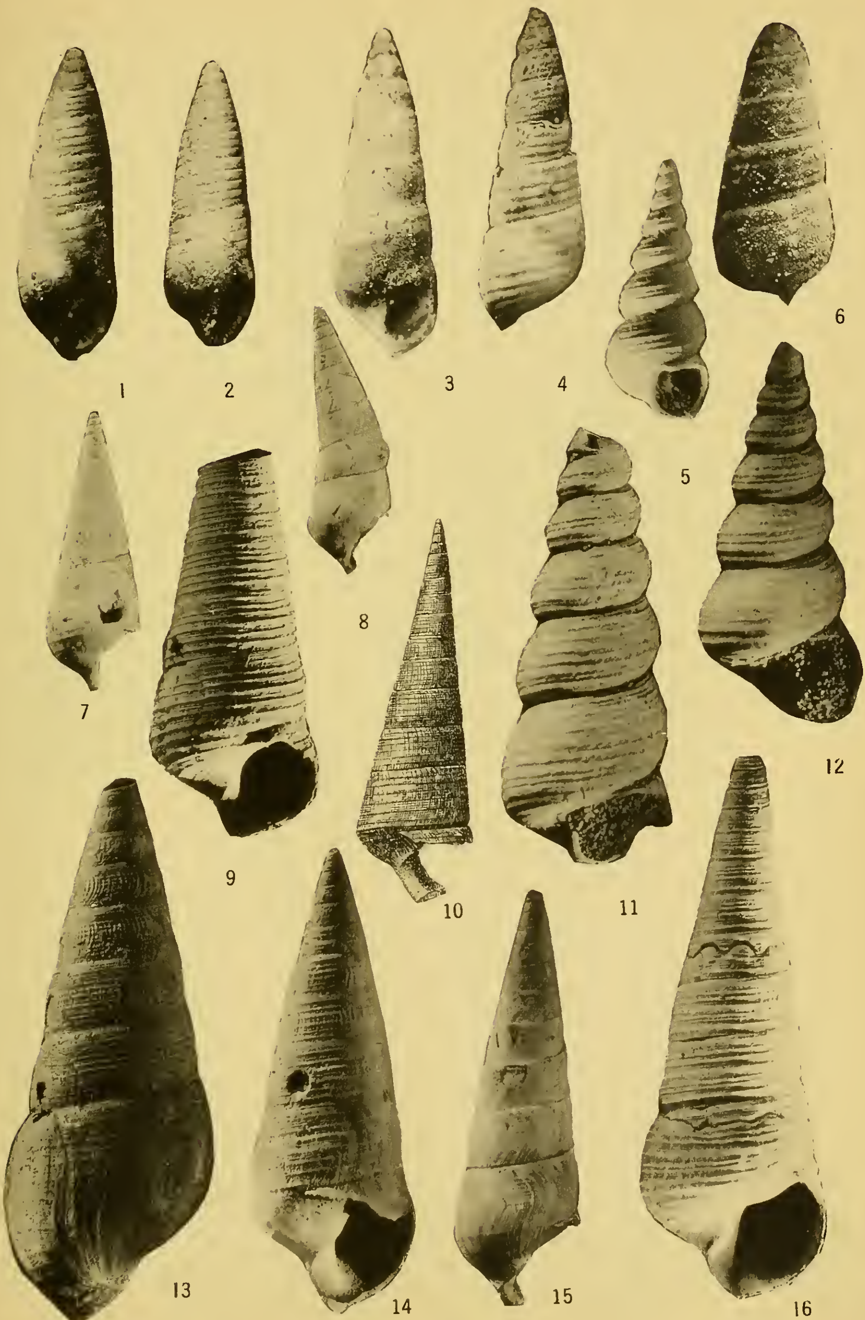

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

PLATE 28

EXPLANATION OF PLATE 28

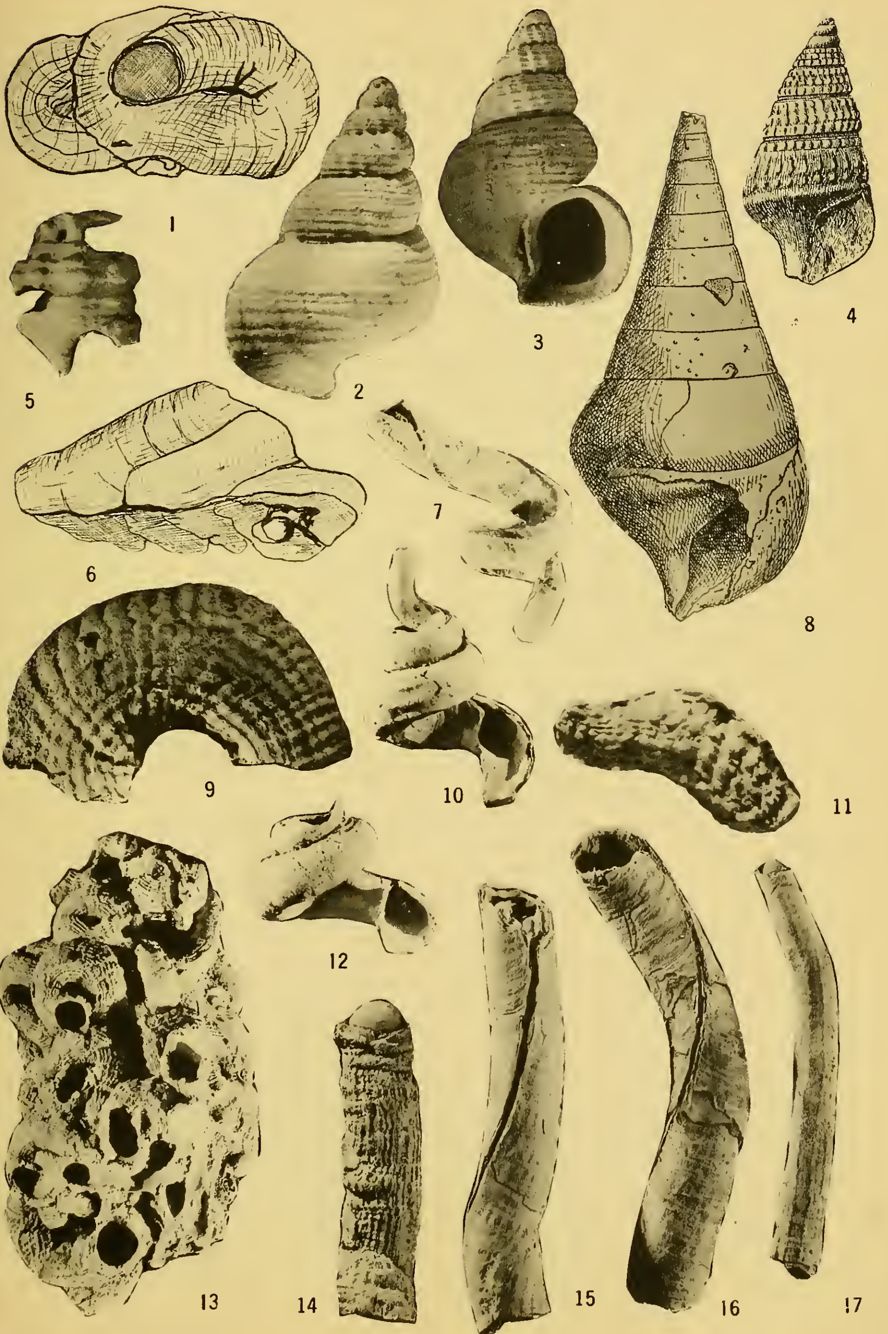

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

PLATE 29

EXPLANATION OF PLATE 29

Figure		Page
1.	**Cerithiella heckscheri**, n. sp. No. 2941, P. R. I., paratype. H., 13 mm.; g. d., 3.5 mm. Lower Claiborne: loc. 728	227
2.	**Cerithiella aldrichi** (Meyer) Copy Meyer	226
3.	**Cerithiella nassula** (Conrad) No. 2945, P. R. I. H., 8.5 mm.; g. d., 2.5 mm. Lower Claiborne, loc. 731	224
4.	**Cerithiella preconica**, n. sp. No. 2947, P. R. I., paratype. H., 4 mm.; g. d., 3 mm. Gosport sand: Claiborne, Ala.	227
5.	**Cerithiella heckscheri**, n. sp. No. 2942, P. R. I., holotype. H., 19 mm.; g. d., 6 mm. Lower Claiborne: loc. 731	227
6.	**Cerithiella heckscheri**, n. sp. Same specimen as fig. 5	227
7.	**Clava ("Ochetoclava") vincta** (Whitfield) No. 2949, P. R. I. H., 38 mm.; g. d., 14 mm. Lower Claiborne: loc. 734	217
8.	**Cerithiella preconica**, n. sp. No. 2948, P. R. I., holotype. H., 13 mm.; g. d., 5 mm. Lower Claiborne: loc. 731	227
9.	**Cerithiella nassula** (Conrad) No. 2946, P. R. I. H., 13 mm.; g. d., 7 mm. Lower Claiborne: loc. 728	224
10.	**Clava ("Ochetoclava") vincta** (Whitfield) Holotype, Walker Museum, Univ. Chicago	217
11.	**Clava ("Ochetoclava") vincta** (Whitfield) Holotype, Walker Museum, Univ. Chicago	217
12.	**"Clava" plicifera** (Heilprin) Harris drawing, U. S. Nat. Mus. specimen	218
13.	**Cerithiella heckscheri**, n. sp. No. 2943, P. R. I., paratype. H., 17 mm.; g. d., 6.5 mm. Lower Claiborne: loc. 731	227
14.	**Cerithiella heckscheri**, n. sp. No. 2944, P. R. I., paratype. H., 18 mm.; g. d., 6 mm. Lower Claiborne: loc. 731	227
15.	**Clava ("Ochetoclava") vincta** (Heilprin) McConnell drawing Lower Claiborne: Murchison's headright, Houston Co., Texas	217
16.	**Clava ("Ochetoclava") vincta** (Heilprin) Copy Vertagus wechesensis Stenzel in Renick and Stenzel	217
17.	**Clava ("Ochetoclava") vincta** (Heilprin) No. 2950, P. R. I. H., 28 mm.; g. d., 11 mm. Lower Claiborne: loc. 758	217
18.	**Clava ("Ochetoclava") vincta** (Whitfield) No. 2951, P. R. I. H., 24 mm.; g. d., 14 mm. Lower Claiborne: loc. 734	217
19.	**Clava ('Ochetoclava") vincta** (Heilprin) Same specimen as fig. 17	217

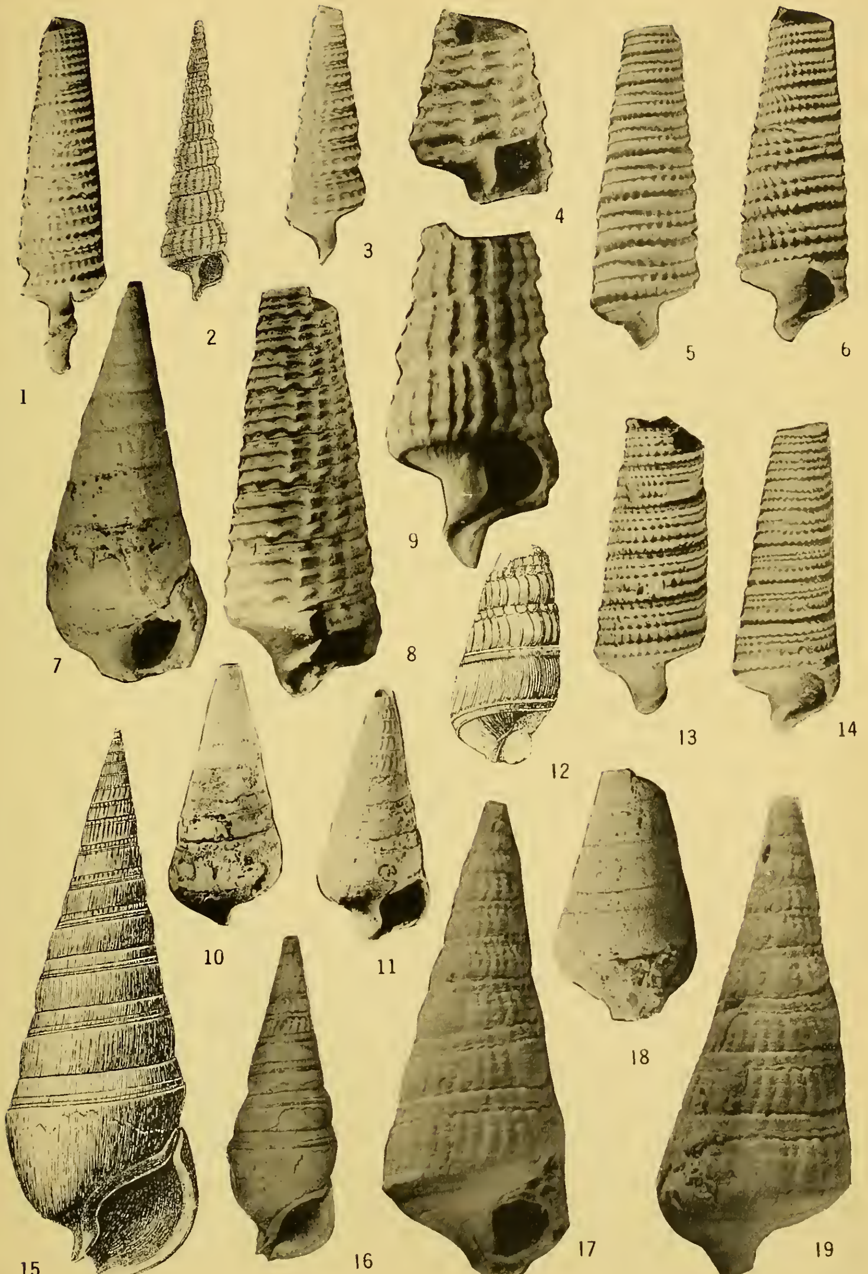

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

PLATE 30

Explanation of Plate 30

Figure		Page
1.	**Triphora major** (Meyer) No. 2952, P. R. I. H., 5 mm.; g. d., 3 mm. Gosport sand: Claiborne, Ala.	229
2.	**Triphora distincta** (Meyer) Copy Meyer	228
3.	**Triphora distincta** (Meyer) Copy Meyer	228
4.	**Triphora major** (Meyer) No. 2953, P. R. I. H., 6 mm.; g. d., 3 mm. Lower Claiborne: loc. 728	229
5.	**Seila constricta** (H. C. Lea) No. 2955, P. R. I. H., 7 mm.; g. d., 2 mm. Gosport sand: Claiborne, Ala.	222
6.	**"Seila" quadristriaris** (Meyer and Aldrich) Copy, Meyer and Aldrich. H., 4.5 mm.	223
7.	**Triphora similis meyeri** (de Gregorio) =**Triphoris** sp. Meyer. Copy Meyer	230
8.	**Triphora major** (Meyer) No. 2954, P. R. I. H., 14 mm.; g. d., 5 mm. Lower Claiborne: loc. 731	229
9.	**Triphora major** (Meyer) Same specimen as fig. 8	229
10.	**Triphora similis** (Meyer) No. 2958, P. R. I. H., 7.5 mm.; g. d., 3 mm. Gosport sand: Claiborne, Ala.	229
11.	**Triphora similis** (Meyer) Same specimen as fig. 10	229
12.	**Seila constricta** (H. C. Lea) No. 2956, P. R. I. H., 5 mm.; g. d., 2 mm.	222

Gosport sand: Claiborne, Ala.

13. **Seila constricta** (H. C. Lea) 222
No. 2957, P. R. I. H., 10 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.

14. **Transovula (Oxycypræa) transovuloides** Schilder 238
=C. attenuata Johnson. Copy Johnson

15. **Transovula (Oxycypræa) naviculæ**, n. sp. 238
No. 2959, P. R. I., holotype. H., 17 mm.; g. d., 7 mm.
Lower Claiborne: loc. 725

16. **Cypræorbis nuculoides** (Aldrich) 231
Copy Aldrich

17. **Cypræorbis nuculoides** (Aldrich) 231
Copy Aldrich

18. **Cypræorbis nuculoides** (Aldrich) 231
Copy Aldrich

19. **Cypræorbis alabamensis** (de Gregorio) 231
Copy De Gregorio

20. **Cyprædia subcancellata** Johnson 234
Copy Johnson

21. **Sulcocypræa vaughani** (Johnson) 236
No. 2960, P. R. I. H., 12 mm.; g. d., 9 mm.
Lower Claiborne: loc. 731

22. **Transovula (Oxycypræa) symmetrica** (Aldrich) 237
Copy Aldrich

23. **Transovula (Oxycypræa) naviculæ**, n. sp. 238
Same specimen as fig. 15

24. **Sulcocypræa vaughani** (Johnson) 236
No. 2961, P. R. I. H., 13 mm.; g. d., 14 mm.
Lower Claiborne: loc. 731

25. **Cypræorbis alabamensis** (de Gregorio) 231
Copy De Gregorio

26. **Cypræorbis alabamensis** (de Gregorio) 231
Copy De Gregorio

27. **Cyprædia gilberti**, n. sp. 234
No. 2962, P. R. I., holotype. H., 27 mm.; g. d., 20 mm.
Gosport sand: Claiborne, Ala.

28. **Cyprædia gilberti**, n. sp. 234
Same specimen as fig. 27

29. **Sulcocypræa kennedyi** (Harris) 236
McConnell drawing, holotype. H., 13 mm.

30. **Sulcocypræa kennedyi** (Harris) 236
McConnell drawing, holotype.

31. **Sulcocypræa lintea** (Conrad) 235
Copy Aldrich, 1886

32. **Sulcocypræa lintea** (Conrad) 235
Copy Aldrich, 1886

33. **Sulcocypræa kennedyi** (Harris) 236
No. 2963, P. R. I. H., 12 mm.; g. d., 8 mm.
Lower Claiborne: loc. 707

34. **Sulcocypræa kennedyi** (Harris) 236
Same specimen as fig. 33

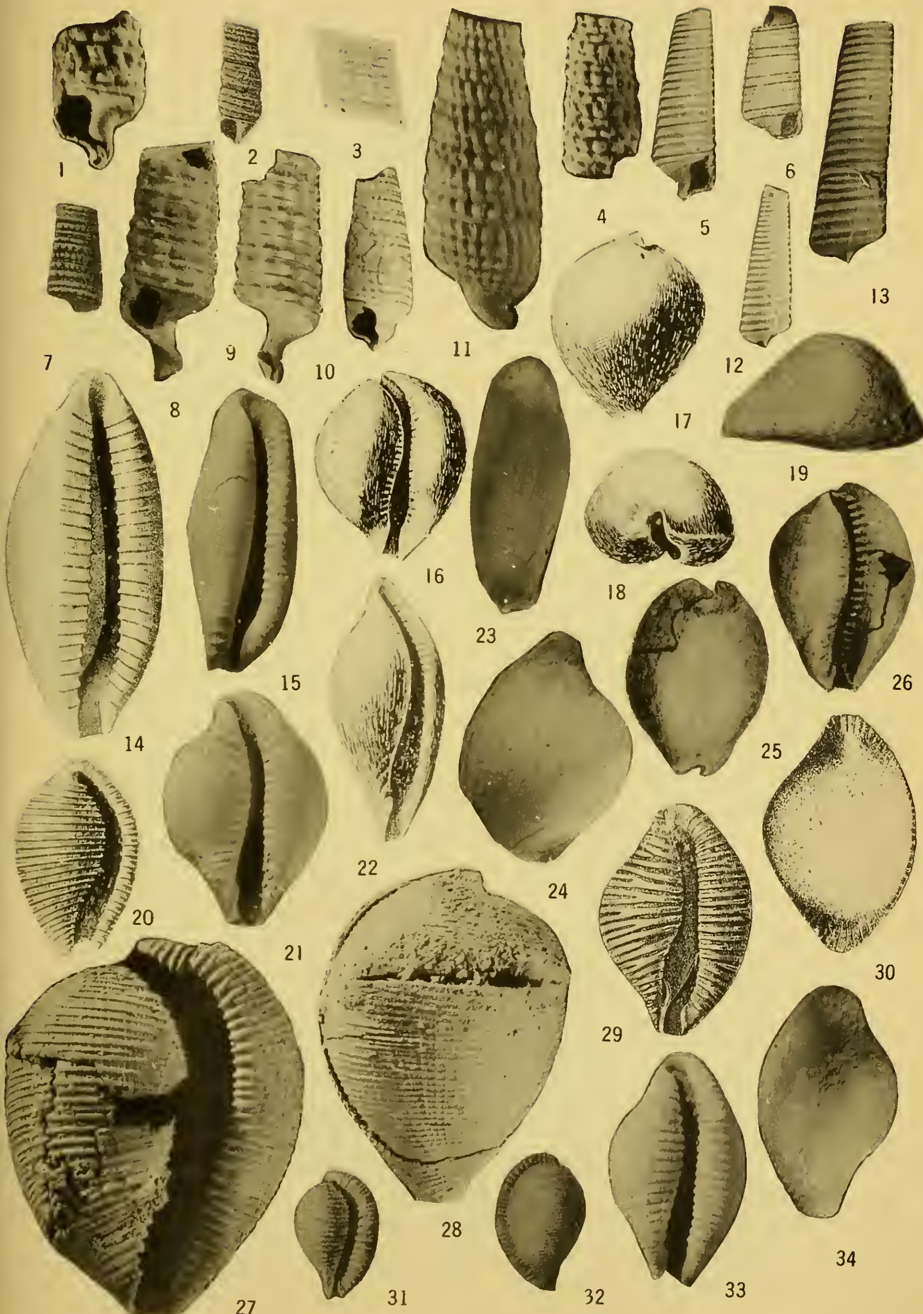

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34

PLATE 31

EXPLANATION OF PLATE 31

Figure		Page
1.	**Leiorhinus prorutus** (Conrad) No. 2964, P. R. I. H., 13 mm.; g. d., 8 mm. Gosport sand: Claiborne, Ala.	247
2.	**Leiorhinus prorutus** (Conrad) No. 2965, P. R. I. H., 15 mm.; g. d., 11 mm. Gosport sand: Claiborne, Ala.	247
3.	**Leiorhinus prorutus** (Conrad) No. 2966, P. R. I. H., 5 mm.; g. d., 3 mm. Gosport sand: Claiborne, Ala.	247
4.	**Phalium brevicostatum** (Conrad) No. 2967, P. R. I. H., 15 mm.; g. d., 10 mm. Lower Claiborne: loc. 728	248
5.	**Calyptraphorus trinodiferus** Conrad No. 2972, P. R. I. H., 56 mm.; g. d., 25 mm. Sabine: Woods Bluff, Ala.	241
6.	**Calyptraphorus trinodiferus** Conrad Same specimen as fig. 5	241
7.	**Galeodea dubia** (Aldrich) Copy Aldrich	252
8.	**Galeodea dubia** (Aldrich) McConnell drawing Lower Claiborne: Collier's ferry, Burleson Shell Bluff, Burleson Co., Texas	252
9.	**Phalium brevicostatum** (Conrad) var. No. 2968, P. R. I. H., 18 mm.; g. d., 15 mm. Lower Claiborne: loc. 733	248
10.	**Phalium brevicostatum** (Conrad) =**Phalium globosum** Dall. Copy, Dall, 1892, pl. 20, fig. 11	248
11.	**Phalium brevicostatum** (Conrad) No. 2969, P. R. I. (broken) Lower Claiborne: loc. 728	248
12.	**Sconsia (Doliocassis) nupera** (Conrad) No. 2971, P. R. I. H., 25 mm.; g. d., 16 mm. Gosport sand: Claiborne, Ala.	253
13.	**Leiorhinus prorutus** (Conrad) Same specimen as fig. 2	247
14.	**Galeodea planotecta** (Meyer and Aldrich) No. 2970, P. R. I. H., 28 mm.; g. d., 25 mm. Lower Claiborne: loc. 724	252
15.	**Neosimnia subtruncata** (Johnson) Holotype, A. N. S.	239
16.	**Neosimnia texana** (Johnson) Holotype, A. N. S.	239
17.	**Galeodea planotecta** (Meyer and Aldrich) Same specimen as fig. 14	252

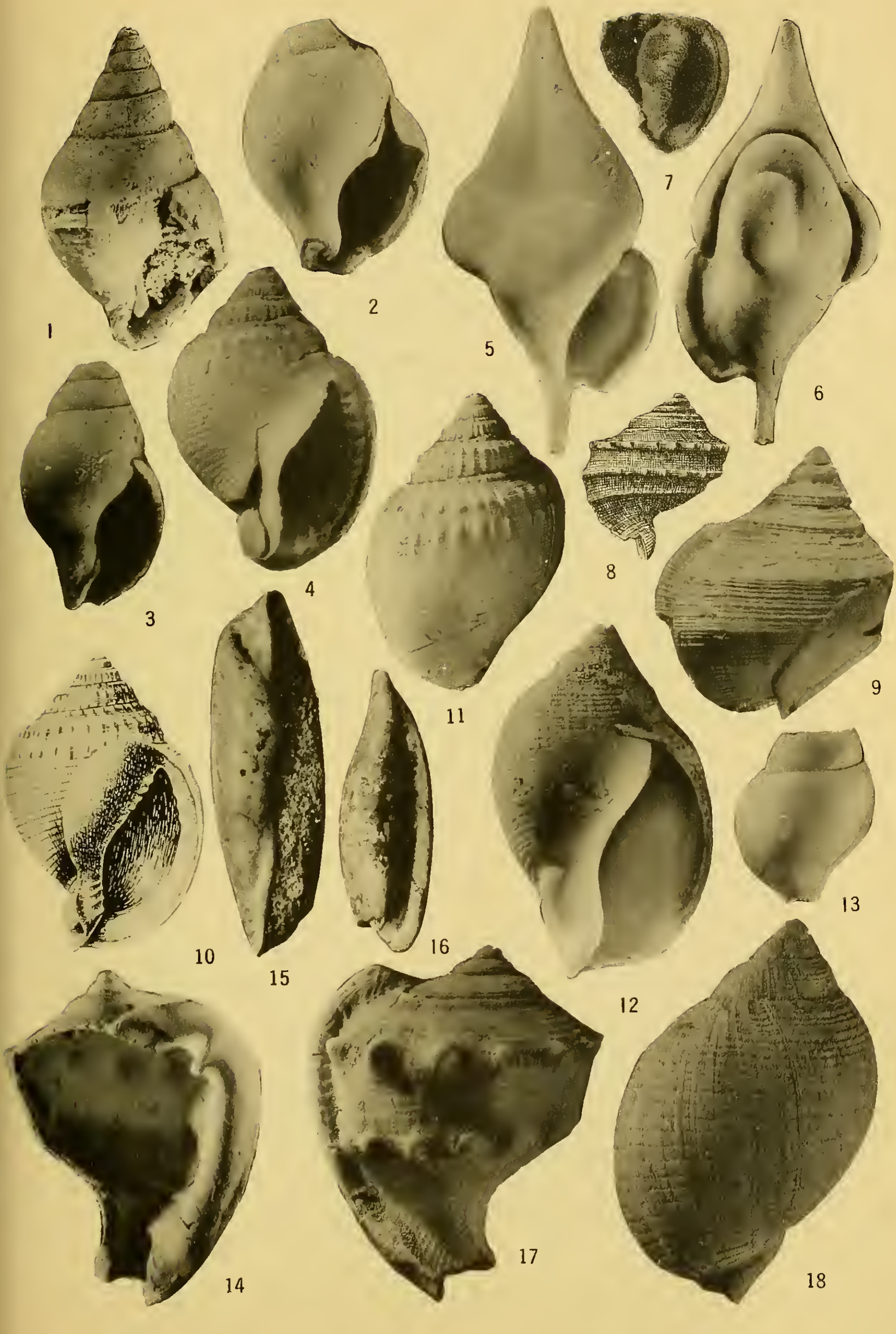

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

PLATE 32

EXPLANATION OF PLATE 32

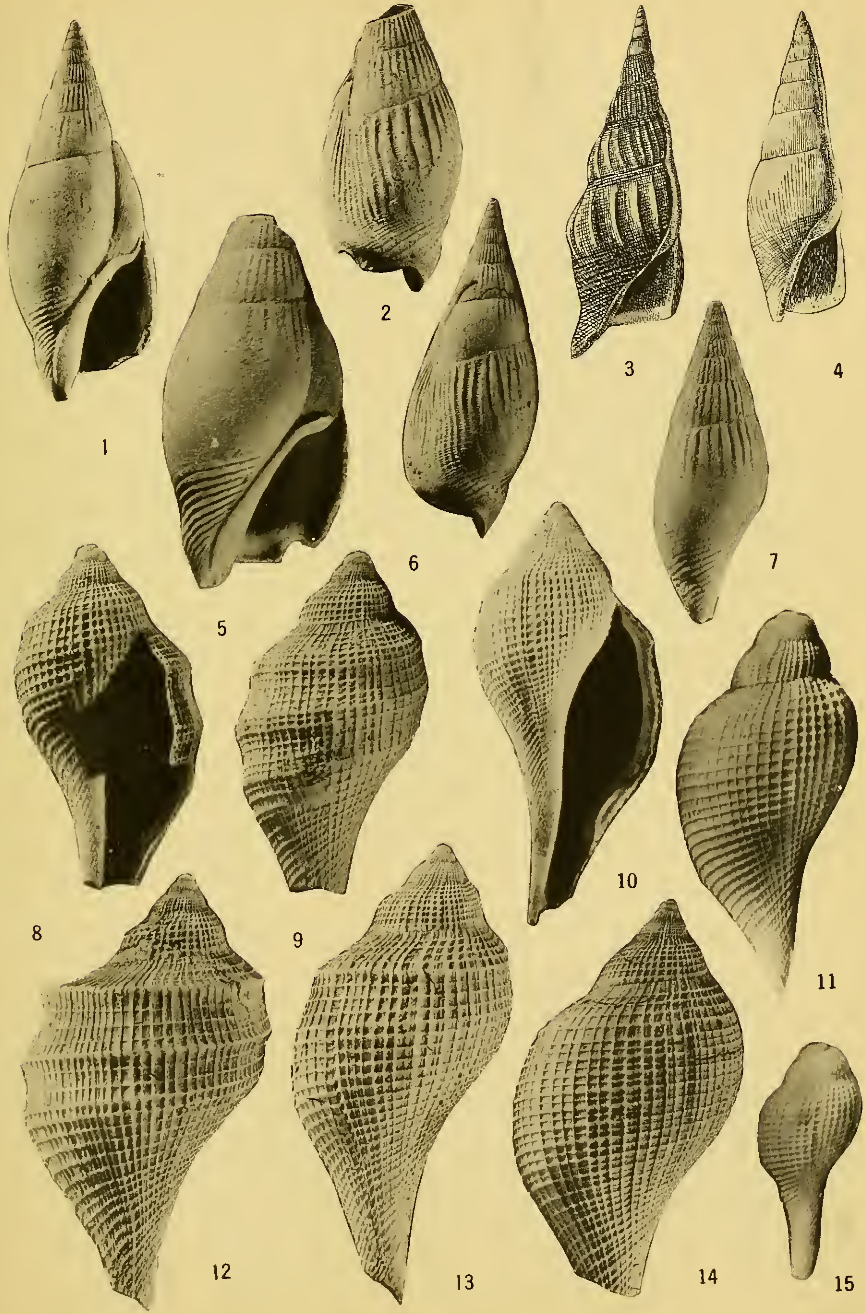
Figure		Page
1.	**Clayptraphorus velatus nodovelatus**, n. var. No. 2973, P. R. I., syntype. H., 40 mm.; g. d., 16 mm. Lower Claiborne: loc. 730	243
2.	**Calyptraphorus velatus nodovelatus**, n. var. No. 2974, P. R. I., syntype. H., 20 mm.; g. d., 8 mm. Lower Claiborne: loc. 730	243
3.	**Calyptraphorus velatus nodovelatus**, n. var. No. 2975, P. R. I., syntype. H., 36 mm.; g. d., 17 mm. Lower Claiborne: loc. 730	243
4.	**Calyptraphorus velatus** (Conrad) No. 2977, P. R. I. H., 16 mm.; g. d., 6 mm. Gosport sand: Claiborne, Ala.	240
5.	**Calyptraphorus velatus nodovelatus**, n. var. No. 2976, P. R. I., syntype. H., 36 mm.; g. d., 17 mm. Lower Claiborne: loc. 730	243
6.	**Calyptraphorus velatus** (Conrad) No. 2978, P. R. I. H., 10 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	240
7.	**Calyptraphorus velatus** (Conrad) No. 2979, P. R. I. H., 43 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	240
8.	**Calyptraphorus velatus** (Conrad) No. 2981, P. R. I. H., 51 mm.; g. d., 17 mm. Jackson Eocene	240
9.	**Calyptraphorus velatus nodovelatus**, n. var. Same specimen as fig. 5	243
10.	**Calyptraphorus velatus** (Conrad) Copy Conrad, 1835	240
11.	**Calyptraphorus velatus** (Conrad) No. 2780, P. R. I. H., 55 mm.; g. d., 19 mm.	240
12.	**Calyptraphorus velatus** (Conrad) Same specimen as fig. 11	240
13.	**Calyptraphorus velatus** (Conrad) Same specimen as fig. 8	240


1
2
3
4
5
6
7
8
9
10
11
12
13

PLATE 33

EXPLANATION OF PLATE 33

Figure		Page
1.	**Ectinochilus laqueatus** (Conrad) No. 2982, P. R. I. H., 38 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	244
2.	**Ectinochilus laqueatus** (Conrad) No. 2983, P. R. I. H., 21 mm.; g. d., 10 mm. Gosport sand: Claiborne, Ala.	244
3.	**Ectinochilus texanus** (Harris) McConnell drawing, holotype. H., 37 mm. Lower Claiborne: Colorado River, Devil's Eye, Bastrop Co., Texas	245
4.	**Ectinochilus texanus planus** (Harris) Harris drawing, holotype. H., 34 mm. Lower Claiborne: Collier's Ferry, Burleson Shell Bluff, Burleson Co., Texas	246
5.	**Ectinochilus laqueatus** (Conrad) Same specimen as fig. 2	244
6.	**Ectinochilus laqueatus** (Conrad) Same specimen as fig. 1	244
7.	**Echinochilus laqueatus** (Conrad) No. 2985, P. R. I. H., 24 mm.; g. d., 8 mm. Gosport sand: Claiborne, Ala.	244
8.	**Ficopsis penita** (Conrad) No. 2986, P. R. I. H., 19 mm.; g. d., 11 mm. Lower Claiborne: loc. 733	255
9.	**Ficopsis penita** (Conrad) Same specimen as fig. 8	255
10.	**Ficopsis penita** (Conrad) No. 2987, P. R. I. H., 35 mm.; g. d., 15 mm. Gosport sand: Claiborne, Ala.	255
11.	**Ficopsis penita** (Conrad) No. 2988, P. R. I. H., 10 mm.; g. d., 5 mm. Lower Claiborne: loc. 741	255
12.	**Ficopsis penita** (Conrad) No. 2989, P. R. I. H., 30 mm.; g. d., 16 mm. Gosport sand: Claiborne, Ala.	255
13.	**Ficopsis penita** (Conrad) Same specimen as fig. 10	255
14.	**Ficopsis penita** (Conrad) No. 2990, P. R. I. H., 30 mm.; g. d., 17 mm. Gosport sand: Claiborne, Ala.	255
15.	**Ficopsis penita** (Conrad) No. 2991, P. R. I. H., 6.5 mm.; g. d., 3 mm. Lower Claiborne: loc. 741	255

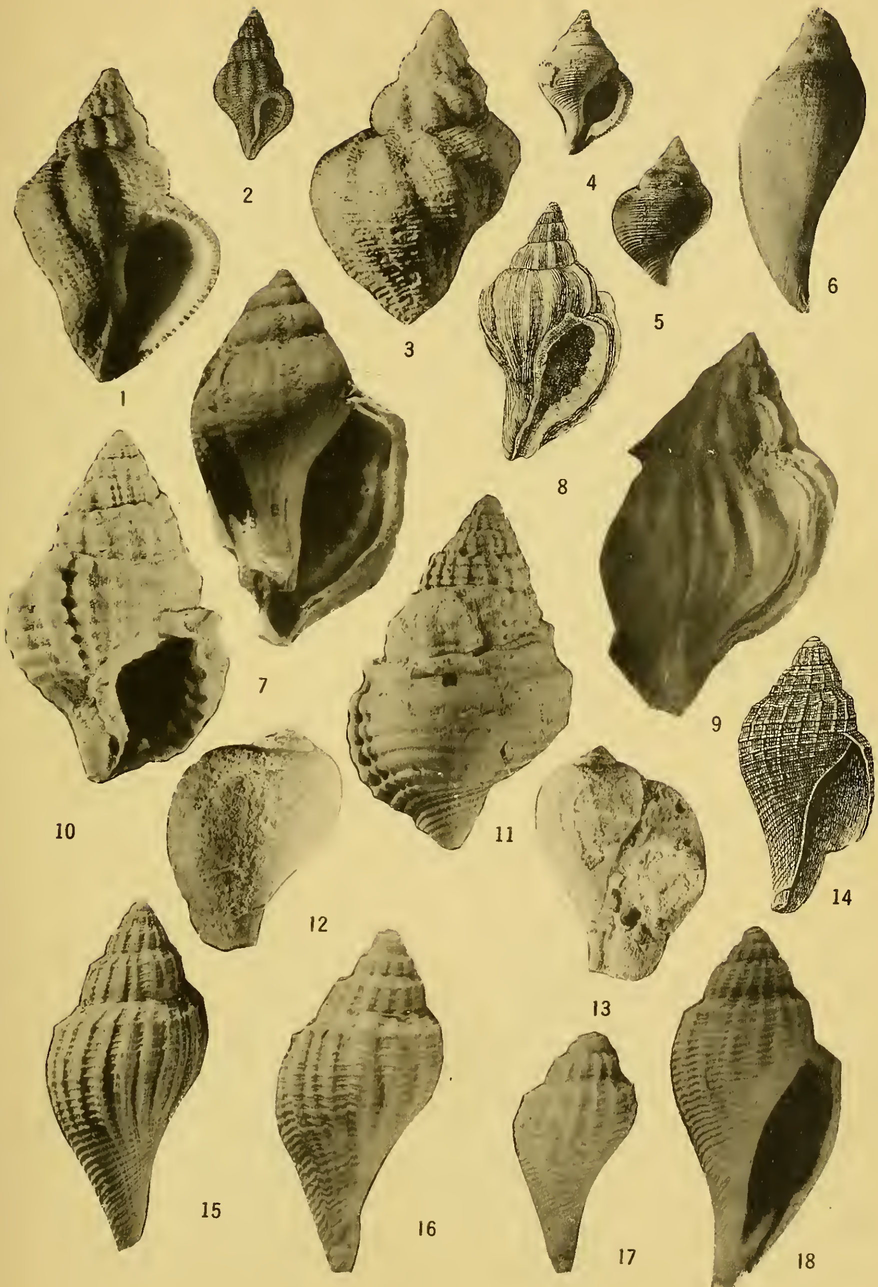


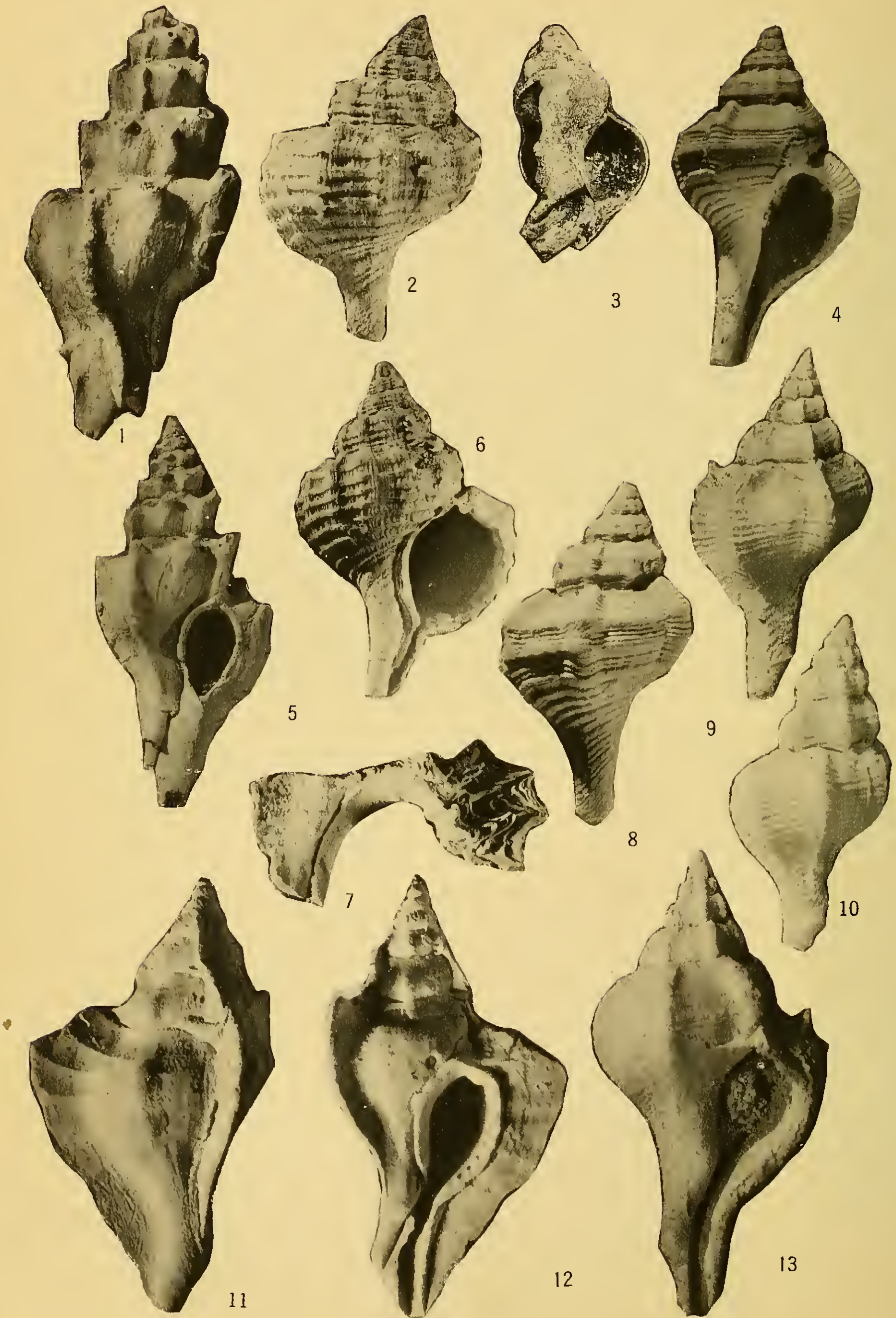
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

PLATE 34

EXPLANATION OF PLATE 34

Figure		Page
1.	**Coralliophila (Aldrichia) Aldrichi** (Cossmann) No. 2996, P. R. I. H., 15 mm.; g. d., 10 mm. Lower Claiborne: loc. 728	262
2.	**Coralliophila (Aldrichia) Aldrichi** (Cossmann) =**Murex cancellaroides** Meyer and Aldrich Copy Meyer and Aldrich	262
3.	**Coralliophila (Aldrichia) Aldrichi** (Cossmann) Same specimen as fig. 1	262
4.	**Ranellina sulcata** (Lea) =**Pisania claibornensis** Whitfield, holotype Walker Museum, Univ. Chicago	259
5.	**Ranellina sulcata** (Lea) Same specimen as fig. 4	259
6.	**Fusificula angelinensis** Harris No. 1414, P. R. I., holotype. Harris, 1919, H., 22 mm.	258
7.	**Odontopolys compsorhytis** Gabb No. 2997, P. R. I. H., 20 mm.; g. d., 10 mm. Lower Claiborne: loc. 730	272
8.	**Odontopolys compsorhytis** Gabb Harris drawing. H., 14 mm. Lower Claiborne: loc. 730	272
9.	**Odontopolys compsorhytis** Gabb Same specimen as fig. 7	272
10.	**Distorsio (Personella) septemdentata** Gabb No. 2998, P. R. I. H., 21 mm.; g. d., 13 mm. Lower Claiborne: loc. 741	260
11.	**Distorsio (Personella) septemdentata** Gabb Same specimen as fig. 10	260
12.	**Ficus affinis** Van Winkle No. 1398, P. R. I., holotype. H., 17 mm.	255
13.	**Ficus affinis** Van Winkle Same specimen as fig. 12	255
14.	**Ficopsis texana** (Harris) McConnell drawing, holotype. H., 13 mm. Lower Claiborne: Moseley's Ferry, Burleson Co., Texas	257
15.	**Ficopsis texana** (Harris) No. 2992, P. R. I. H., 20 mm.; g. d., 10 mm. Lower Claiborne: loc. 728	257
16.	**Ficopsis texana** (Harris) Same specimen as fig. 15	257
17.	**Ficopsis texana** (Harris) No. 2995, P. R. I. H., 19 mm.; g. d., 9 mm. Lower Claiborne: loc. 728	257
18.	**Ficopsis texana** (Harris) No. 2994, P. R. I. H., 9 mm.; g. d., 4 mm. Lower Claiborne: loc. 728	257
19.	**Ficopsis texana** (Harris) No. 2993, P. R. I. H., 19 mm.; g. d., 9 mm. Lower Claiborne: loc. 728	257

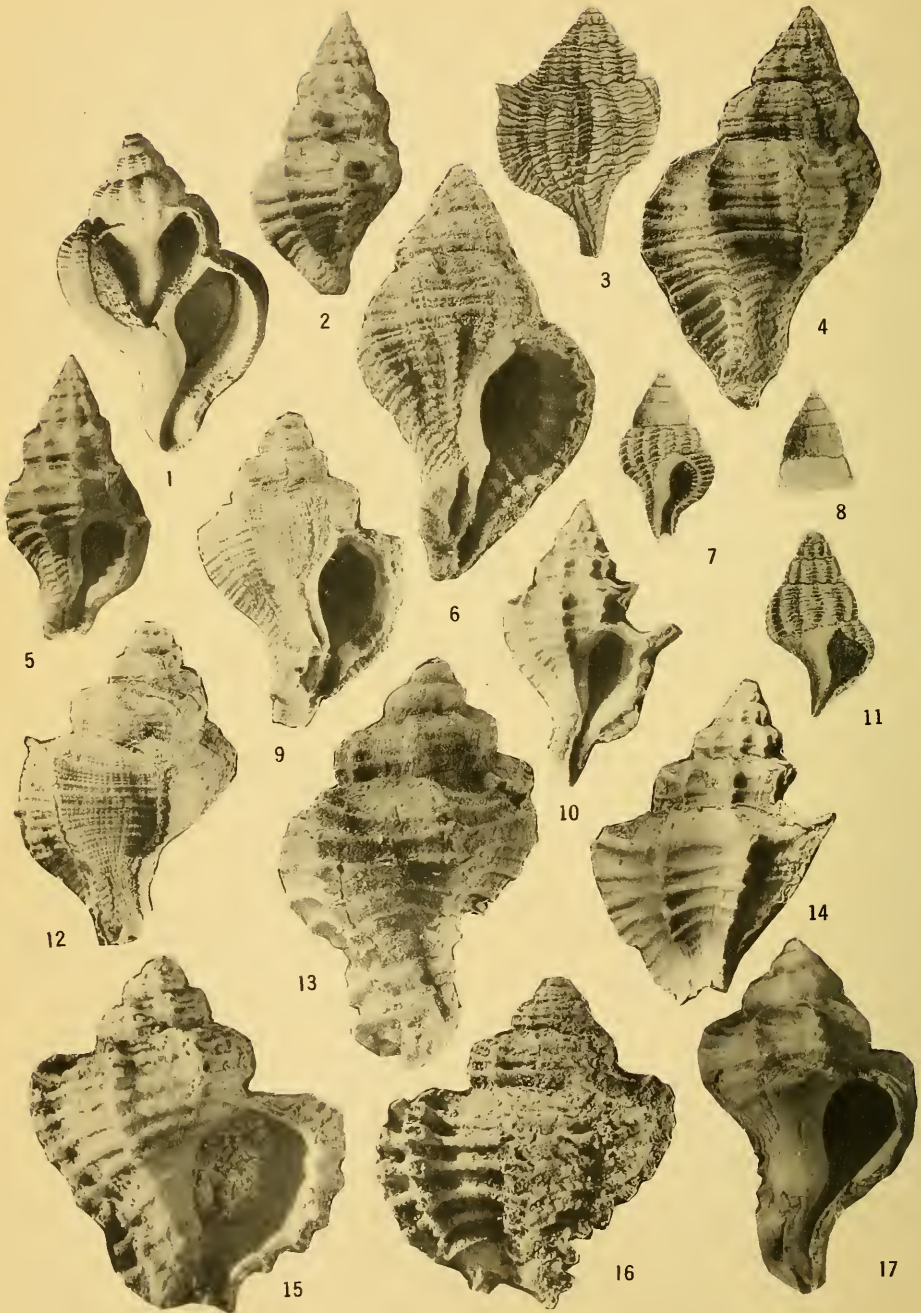

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18


1
2
3
4
5
6
7
8
9
10
11
12
13

EXPLANATION OF PLATE 36

Figure		Page
1.	**Typhis gracilis** Conrad No. 3007, P. R. I. H., 17 mm.; g. d., 9 mm. Gosport sand: Claiborne, Ala.	271
2.	**Murotriton grassator** de Gregorio No. 3009, P. R. I. H., 20 mm.; g. d., 13 mm. Gosport sand: Claiborne, Ala.	270
3.	**Murex gosportensis** Aldrich, n. sp. No. 72, Ala. Mus. Nat. Hist., holotype. H., 32 mm. Gosport sand: Claiborne, Ala.	268
4.	**Murotriton mcglameriæ**, n. sp. No. 3010, P. R. I., holotype. H., 19 mm.; g. d., 10 mm. Lower Claiborne: loc. 728	271
5.	**Typhis gracilis** Conrad No. 3008, P. R. I. H., 15 mm.; g. d., 7 mm. Gosport sand: Claiborne, Ala.	271
6.	**Murotriton grassator** de Gregorio Same specimen as fig. 2	270
7.	**Murex veatchi**, n. sp. No. 3011, P. R. I., paratype. G. d., 19 mm. Lower Claiborne: loc. 725	266
8.	**Murotriton mcglameriæ**, n. sp. Same specimen as fig. 4	271
9.	**Murex engonatus** Conrad No. 3015, P. R. I. H., 14 mm.; g. d., 6 mm. Lower Claiborne: loc. 728	267
10.	**Murex engonatus** Conrad No. 3016, P. R. I. H., 10 mm.; g. d., 5 mm. Lower Claiborne: loc. 728	267
11.	**Murex veatchi**, n. sp. No. 3012, P. R. I., holotype. H., 16 mm.; g. d., 9 mm. Lower Claiborne: loc. 725	266
12.	**Murex veatchi**, n. sp. Same specimen as fig. 11	266
13.	**Murex engonatus** Conrad Same specimen as fig. 9	267

PLATE 36


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

EXPLANATION OF PLATE 35

Figure		Page
1.	cf. **Murex migus** de Gregorio No. 2999, P. R. I. H., 16 mm.; g. d., 10 mm. Lower Claiborne: loc. 728	268
2.	**Murex Vanuxemi** Conrad No. 3000, P. R. I. H., 14 mm.; g. d., 7 mm. Lower Claiborne: loc. 733	263
3.	**Murex migus** de Gregorio Copy De Gregorio	268
4.	**Murex colei,** n. sp. No. 3002, P. R. I., holotype. H., 26 mm.; g. d., 14 mm. Lower Claiborne: loc. 707	265
5.	**Murex Vanuxemi** Conrad Same specimen as fig. 2	263
6.	**Murex colei,** n. sp. Same specimen as fig. 5	265
7.	**Murex migus** de Gregorio Copy De Gregorio	268
8.	**Murex migus** de Gregorio Copy De Gregorio	268
9.	**Murex Vanuxemi** Conrad No. 3001, P. R. I. H., 20 mm.; g. d., 11 mm. Gosport sand: Claiborne, Ala.	263
10.	**Murex Vanuxemi silvaticus,** n. var. No. 3003, P. R. I., holotype. G. d., 5 mm. Lower Claiborne: loc. 741	264
11.	**Murex migus** de Gregorio Copy De Gregorio	268
12.	**Murex Vanuxemi** Conrad Same specimen as fig. 9	263
13.	**Murex (Phyllonotus) Mantelli** Conrad No. 3005, P. R. I. H., 26 mm.; g. d., 18 mm. Gosport sand: Claiborne, Ala.	269
14.	**Murex Vanuxemi silvaticus,** n. var. No. 3004, P. R. I., paratype. H., 11 mm.; g. d., 7 mm. Gosport sand: Claiborne, Ala.	264
15.	**Murex (Phyllonotus) Mantelli** Conrad No. 3006, P. R. I. H., 19 mm.; g. d., 16 mm. Gosport sand: Claiborne, Ala.	269
16.	**Murex (Phyllonotus) Mantelli** Conrad Same specimen as fig. 15	269
17.	**Murex (Phyllonotus) Mantelli** Conrad Same specimen as fig. 13	269

PLATE 35

PLATE 37

EXPLANATION OF PLATE 37

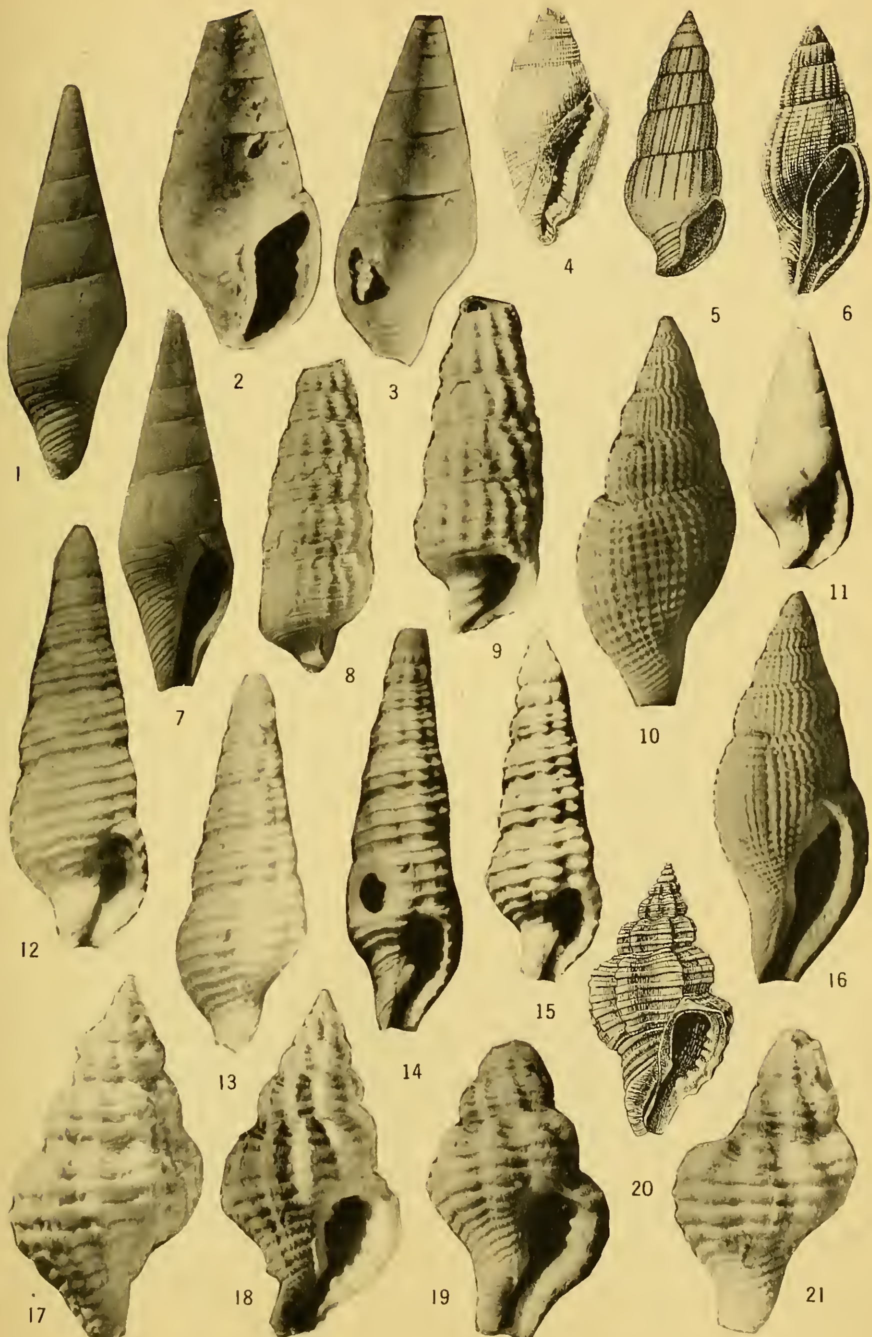

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

PLATE 38

Explanation of Plate 38

Figure		Page
1.	**Monoptygma leai** Whitfield	297
	No. 3026, P. R. I. H., 22 mm.; g. d. 10 mm.	
	Lower Claiborne: loc. 734	
2.	**Monoptygma leai** Whitfield	297
	Same specimen as fig. 1	
3.	**Monoptygma crassiplica** Conrad	298
	No. 3027, P. R. I. H., 23 mm.; g. d., 11 mm.	

Lower Claiborne: loc. 735

4. **Monoptygma crassiplica** Conrad 298
Harris drawing. H., 24 mm. U. S. Nat. Mus. specimen

5. **Monoptygma crassiplica** Conrad 298
Same specimen as fig. 3

6. **Monoptygma leai** Whitfield 297
Holotype, Walker Mus. Univ. Chicago

7. **Mitrella (Clinurella) bucciniformis** (Heilprin) 281
No. 3028, P. R. I. H., 7.5 mm.; g. d., 3.5 mm.
Lower Claiborne: loc. 707

8. **Monoptygma leai** Whitfield 297
Same specimen as fig. 6

9. **Monopygoma (Clinurella) bucciniformis** (Heilprin) 281
Chrysodomus parbrazana Harris. McConnell drawing holotype. H., 12 mm.
Lower Claiborne: Little Brazos R., near bridge on Moseley's ferry road, Texas

10. **Monotypgma (Clinurella) bucciniformis** (Heilprin) 281
No. 3029, P. R. I. H., 8 mm.; g. d., 4 mm.
Lower Claiborne: loc. 707

11. **Anachis (Astyris) crassus** Chavan, n. sp. 284
Drawing by Chavan, holotype. H., 9 mm.

12. **Anachis (Astyris) crassus** Chavan, n. sp. 284
Drawing by Chavan, paratype H., 6 mm.

13. **Mitrella (Clinurella) casteri**, n. sp. 282
No. 3030, P. R. I., paratype. H., 8 mm.; g. d., 4 mm.
Lower Claiborne: loc. 707

14. **Mitrella (Clinurella) casteri**, n. sp. 282
No. 3031, P. R. I., paratype. H., 11 mm.; g. d., 6 mm.
Lower Claiborne: loc. 707

15. **Mitrella (Clinurella) casteri**, n. sp. 282
No. 3032, P. R. I., holotype. H., 11 mm.; g. d., 6 mm.
Lower Claiborne: loc. 707

16. **Mitrella (Columbellopsis) mississippiensis** (Meyer and Aldrich) 278
No. 3034, P. R. I. H., 14 mm.; g. d., 8 mm.
Lower Claiborne: loc. 728

17. **Mitrella (Columbellopsis) mississippiensis** (Meyer and Aldrich) 278
Same specimen as fig. 16

18. **Mitrella (Clinurella) casteri**, n. sp. 283
No. 3033, P. R. I., paratype. H., 4 mm.; g. d., 2 mm.
Lower Claiborne: loc. 707

19. **Monoptygma lymneoides** (Conrad) 296
No. 3036, P. R. I., H., 35 mm.; g. d., 16 mm.
Gosport sand: loc. 104

20. **Monoptygma lymneoides** (Conrad) 296
Same specimen as fig. 19

21. **Mitrella (Columbellopsis) mississippiensis** (Meyer and Aldrich) 278
No. 3035, P. R. I. H., 8.5 mm.; g. d., 4.5 mm.
Lower Claiborne: loc. 707

22 **Mitrella (Columbellopsis) mississippiensis** (Meyer and Aldrich) 278
Same specimen as fig. 21

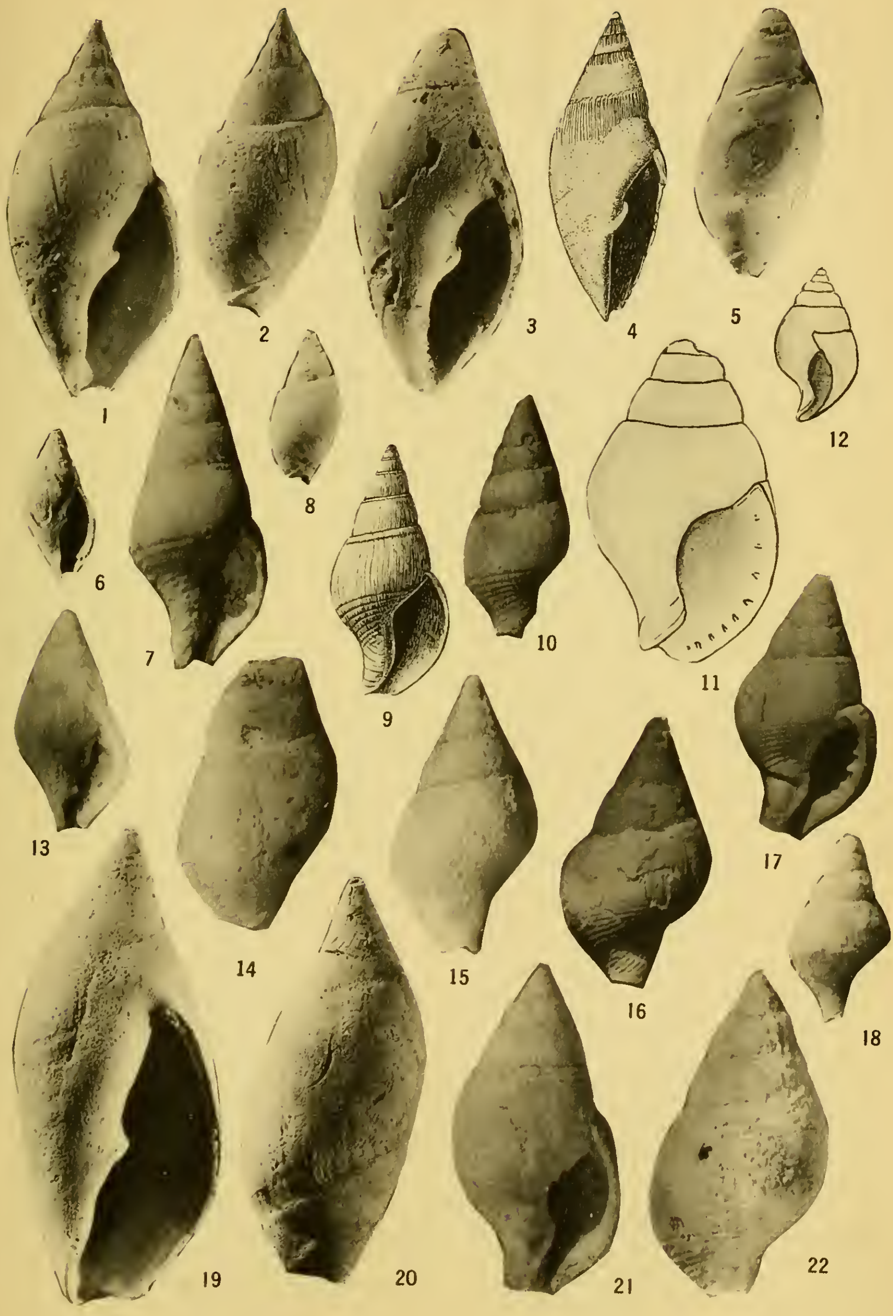

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

PLATE 39

EXPLANATION OF PLATE 39

Figure		Page
1.	**Bullia altilis subglobosa** (Conrad) **Expleritoma prima** Aldrich. No. 3037, P. R. I., H., 28 mm.; g. d., 20 mm. Gosport sand: Claiborne, Ala.	289
2.	**Bullia altilis harrisi** Palmer No. 356, P. R. I., paratype. H., 18 mm.; g. d., 14 mm. Lower Claiborne: loc. 776	290
3.	**Bullia altilis harrisi** Palmer No. 357, P. R. I., paratype, H., 20 mm.; g. d., 16 mm. Lower Claiborne: loc. 776	290
4.	**Bullia altilis subglobosa** (Conrad) No. 3038, P. R. I. H., 25 mm.; g. d., 20 mm. Gosport sand: Claiborne, Ala.	289
5.	**Bullia altilis subglobosa** (Conrad) Same specimen as fig. 4	289
6.	**Bullia altilis subglobosa** (Conrad) Same specimen as fig. 1	289
7.	**Bullia altilis** (Conrad) No. 3039, P. R. I. H., 27 mm.; g. d., 18 mm. Young. Gosport sand: Claiborne, Ala.	287
8.	**Bullia altilis** (Conrad) No. 3040, P. R. I. H., 45 mm.; g. d., 28 mm. Gosport sand: Claiborne, Ala.	287
9.	**Bullia altilis** (Conrad) Same specimen as fig. 8	287
10.	**Bullia altilis harrisi** (Palmer) No. 360, P. R. I., holotype. H., 16 mm.; g. d., 11 mm. Gosport sand: Claiborne, Ala.	290
11.	**Bullia altilis subglobosa** (Conrad) No. 3042, P. R. I. H., 50 mm.; g. d., 39 mm. Gosport sand: Claiborne, Ala.	289
12.	**Bullia altilis subglobosa** (Conrad) Same specimen as fig. 11	289
13.	**Bullia altilis harrisi** Palmer Same specimen as fig. 10	290

PLATE 40

EXPLANATION OF PLATE 40

Figure		Page
1.	**Bullia altilis subglobosa** (Conrad) No. 3043, P. R. I. H., 31 mm.; g. d., 22 mm. Sabine: Hatchetigbee, Ala.	289
2.	**Bullia altilis subglobosa** (Conrad) No. 3044, P. R. I. H., 20 mm.; g. d., 14 mm. Sabine: Hatchetigbee, Ala.	289
3.	**Bullia altilis subglobosa** (Conrad) Same specimen as fig. 2	289
4.	**Bullia (Anbullina) ancillops** (Heilprin) No. 3045, P. R. I. H., 28 mm.; g. d., 12 mm. Lower Claiborne: loc. 733	292
5.	**Bullia altilis subglobosa** (Conrad) Same specimen as fig. 1	289
6.	**Bullia (Anbullina) ancillops** (Heilprin) Same specimen as fig. 4	292
7.	**Buccinanops calli** (Aldrich) Copy, Aldrich	294
8.	**Lisbonia expansa** (Aldrich) No. 3046, P. R. I. H., 25 mm.; g. d., 14 mm. Young. Lower Claiborne: loc. 734	295
9.	**Buccinanops calli** (Aldrich) Copy, Aldrich	294
10.	**Bulovia weisbordi**, n. sp. No. 3048, P. R. I. H., 22 mm.; g. d., 9 mm. Lower Claiborne: loc. 733	293
11.	**Bulovia weisbordi**, n. sp. Same specimen as fig. 10	293
12.	**Lisbonia expansa** (Aldrich) No. 3047, P. R. I. H., 80 mm.; g. d., 55 mm. Lower Claiborne: Ala.	295
13.	**Lisbonia expansa** (Aldrich) Same specimen as fig. 12	295


1
2
3
4
5
6
7
8
9
10
11
12
13

PLATE 41

EXPLANATION OF PLATE 41

Figure		Page
1.	**Dorsanum bellaliratum** (Gabb) Holotype, A. N. S.	299
2.	**Buccitriton texanus** (Gabb) No. 3049, P. R. I. H., 14 mm.; g. d., 7 mm. Lower Claiborne: loc. 723	305
3.	**Buccitriton texanus** (Gabb) No. 3056, P. R. I. H., 4 mm.; g. d., 2 mm. Young. Lower Claiborne: loc. 723	305
4.	**Buccitriton sagenus** (Conrad) No. 3055, P. R. I. H., 12 mm.; g. d., 7 mm. Lower Claiborne: loc. 728	303
5.	**Dorsanum scalatum** (Heilprin) No. 3051, P. R. I. H., 15 mm.; g. d., 7 mm. Lower Claiborne: loc. 723	300
6.	**Buccitriton texanus** (Gabb) No. 3050, P. R. I. H., 10 mm.; g. d., 4.5 mm. Lower Claiborne: loc. 723	305
7.	**Buccitriton sagenus** (Conrad) No. 3053, P. R. I. H., 9 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	303
8.	**Buccitriton sagenus** (Conrad) No. 3054, P. R. I. H., 8 mm.; g. d., 4 mm. Immature. Gosport sand: Claiborne, Ala.	303
9.	**Buccitriton sagenus** (Conrad) No. 3052, P. R. I. H., 4 mm.; g. d., 2.5 mm. Young. Gosport sand: Claiborne, Ala.	303
10.	**Dorsanum scalatum** (Heilprin) Same specimen as fig. 5	300
11.	**Cornulina minax** (Solander) No. 3057, P. R. I. H., 60 mm.; g. d., 33 mm. Paris Basin. Lutetian-Bartonian	338
12.	**Cornulina minax armigera** (Conrad) No. 3058, P. R. I. H., 68 mm.; g. d., 50 mm. Lower Claiborne: 766	339
13.	**Cornulina minax heilpriniana** Harris Harris drawing, holotype. H., 14 mm.	340
14.	**Cornulina minax armigera** (Conrad) No. 3059, P. R. I. H., 62 mm.; g. d., 45 mm. Gosport sand: Claiborne, Ala. (type locality omitted from text)	339
15.	**Cornulina minax armigera** (Conrad) Same specimen as fig. 14	339

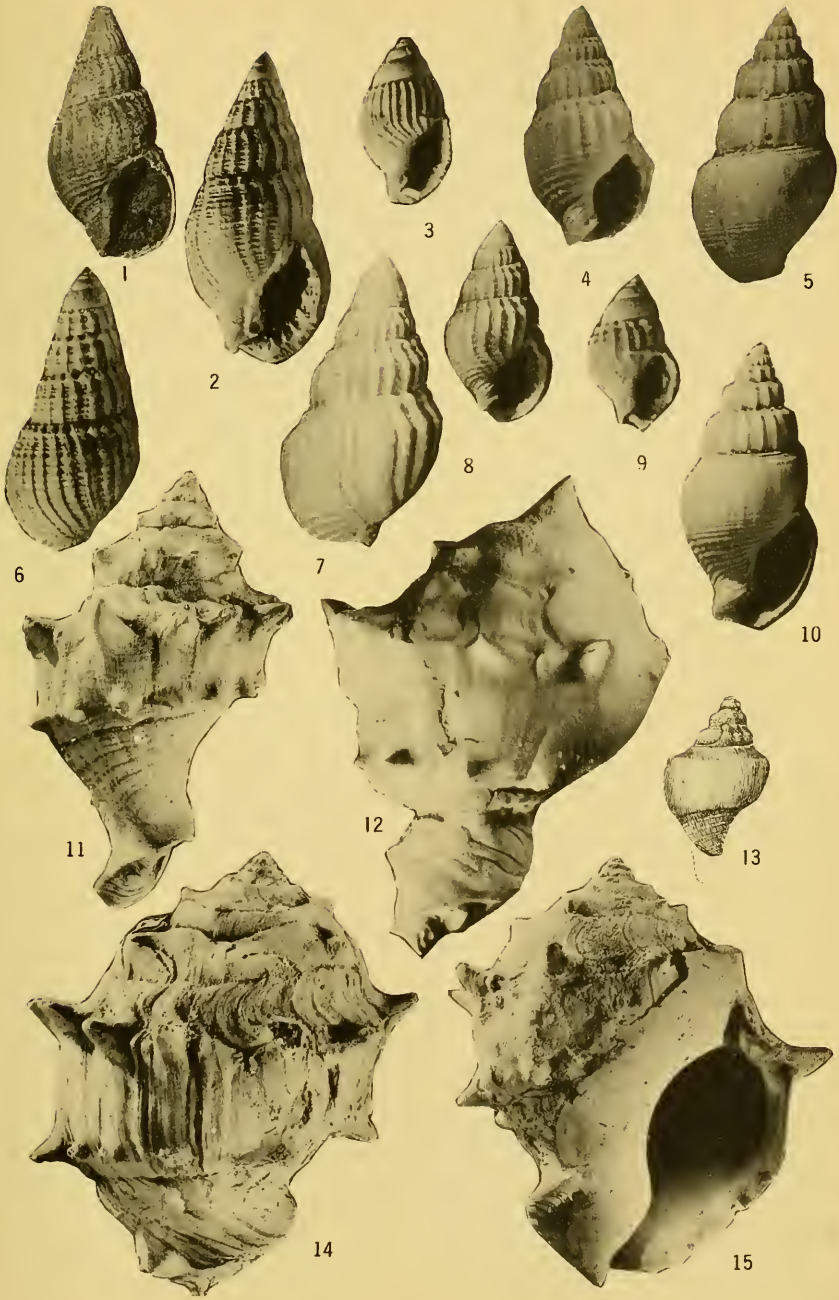

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

PLATE 42

EXPLANATION OF PLATE 42

Figure		Page
1.	**Pseudoliva vetusta perspectiva** Conrad No. 3060, P. R. I. H., 25 mm.; g. d., 16 mm. Jackson Eocene: Montgomery, La.	313
2.	**Pseudoliva vetusta perspectiva** Conrad No. 3041, P. R. I. H., 29 mm.; g. d., 19 mm. Jackson Eocene	313
3.	**Pseudoliva vetusta persectiva** Conrad No. 3061, P. R. I. H., 10 mm.; g. d., 6 mm. Young. Lower Claiborne: loc. 728	313
4.	**Pseudoliva vetusta perspectiva** Conrad No. 3062, P. R. I. H., 19 mm.; g. d., 13 mm. Lower Claiborne: loc. 728	313
5.	**Pseudoliva vetusta perspectiva** Conrad No. 3063, P. R. I. H., 34 mm.; g. d., 23 mm. **Pseudoliva carinata** Conrad. Lower Claiborne: loc. 741	313
6.	**Pseudoliva vetusta perspectiva** Conrad Same specimen as fig. 5	313
7.	**Bullia tenera** (Conrad) No. 3074, P. R. I. H., 26 mm.; g. d., 15 mm. Lower Claiborne: loc. 138	291
8.	**Bullia tenera** (Conrad) No. 3065, P. R. I. H., 25 mm.; g. d., 15 mm. Lower Claiborne: loc. 138	291
9.	**Bullia tenera** (Conrad) No. 3065, P. R. I. H., 25 mm.; g. d., 15 mm. Lower Claiborne: loc. 138	291
10.	**Bullia tenera** (Conrad) No. 3066, P. R. I. H., 41 mm.; g. d., 22 mm. Lower Claiborne: loc. 766	291
11.	**Bullia tenera** (Conrad) Same specimen as fig. 10	291
12.	**Bullia tenera** (Conrad) Holotype, A. N. S.	291
13.	**Bullia tenera** (Conrad) Same specimen as fig. 7	291


1
2
3
4
5
6
7
8
9
10
11
12
13

PLATE 43

EXPLANATION OF PLATE 43

Figure		Page
1.	**Pseudoliva vetusta** (Conrad) No. 3067, P. R. I. H., 31 mm.; g. d., 24 mm. Gosport sand: loc. 104	310
2.	**Pseudoliva vetusta linosa** (Conrad) No. 3070, P. R. I. H., 15 mm.; g. d., 11 mm. Lower Claiborne: loc. 733	315
3.	**Pseudoliva vetusta linosa** (Conrad) No. 3071, P. R. I. H., 25 mm.; g. d., 18 mm. Lower Claiborne: loc. 733	315
4.	**Pseudoliva vetusta** (Conrad) No. 3075, P. R. I. H., 25 mm.; g. d., 16 mm. Gosport sand: Claiborne, Ala.	310
5.	**Pseudoliva vetusta** (Conrad) No. 3076, P. R. I. H., 38 mm.; g. d., 29 mm. Sabine Eocene	310
6.	**Pseudoliva vetusta** (Conrad) No. 3077, P. R. I. H., 35 mm.; g. d., 25 mm' Sabine Eocene	310
7.	**Pseudoliva vetusta** (Conrad) No. 3074, P. R. I. H., 31 mm.; g. d., 23 mm. Gosport sand: Claiborne, Ala.	310
8.	**Pseudoliva vetusta** (Conrad) No. 3068, P. R. I. H., 33 mm.; g. d., 24 mm. Gosport sand: Claiborne, ,Ala.	310
9.	**Pseudoliva vetusta** var. **P. fusiformis** (Conrad) No. 3073, P. R. I. H., 15 mm.; g. d., 7 mm. Lower Claiborne: loc. 723	314
10.	**Pseudoliva vetusta linosa** Conrad Same specimen as fig. 2	315
11.	**Pseudoliva vetusta** (Conrad) No. 3072, P. R. I. H., 11 mm.; g. d., 7 mm. Young. Gosport sand: Claiborne, Ala.	310
12.	**Pseudoliva vetusta** (Conrad) No. 3069, P. R. I. H., 41 mm.; g. d., 33 mm. Gosport sand: Claiborne, Ala.	310
13.	**Pseudoliva vetusta** (Conrad) Same specimen as fig. 12	310
14.	**Pseudoliva vetusta** (Conrad) No. 3078, P. R. I H., 12.5 mm.; g. d., 8 mm. Young. Gosport sand: Claiborne, Ala.	310


1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 44

EXPLANATION OF PLATE 44


1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 45

EXPLANATION OF PLATE 45

Figure		Page
1.	**Verconella Delabechii** (Lea) No. 3089, P. R. I. H., 10 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	319
2.	**Verconella Delabechii** (Lea) No. 3090, P. R. I. H., 14 mm.; g. d., 8 mm. Gosport sand: Claiborne, Ala.	319
3.	**"Siphonalia" plummeri**, n. sp. No. 3092, P. R. I., holotype. H., 7 mm.; g. d., ,4 mm. Lower Claiborne: loc. 733	318
4.	**"Siphonalia" plummeri**, n. sp. Same specimen as fig. 3	318
5.	**"Siphonalia" newtonensis** (Meyer and Aldrich) Copy, Meyer and Aldrich	317
6.	**Verconella bella leai**, n. var. No. 3093, P. R. I., syntype. H., 11.5 mm., g. d., 5 mm. Gosport sand: Claiborne, Ala.	322
7.	**Verconella bella leai**, n. var. No. 3094, P. R. I., syntype. H., 12 mm.; g. d., 6 mm. Gosport sand: Claiborne, Ala.	322
8.	**Verconella Delabechii** (Lea) No. 3091, P. R. I. H., 7 mm.; g. d., 4 mm. Gosport sand: Claiborne, Ala.	319
9.	**Verconella Delabechii** (Lea) **Strepsidura lintea** Conrad, holotype, A. N. S.	319
10.	**Verconella crebrissima** (Lea) No. 3096, P. R. I. H., 10 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	319
11.	**Verconella bella** (Conrad) No. 3098, P. R. I. H., 12.5 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	320
12.	**Verconella bella** (Conrad) No. 3099, P. R. I. H., 15 mm.; g. d., 7 mm. Gosport sand: Claiborne, Ala.	320
13.	**Cantharus casteri**, n. sp. No. 3100, P. R. I., holotype. H., 22 mm.; g. d., 11 mm. Lower Claiborne: loc. 733	322
14.	**Verconella crebrissima** (Lea) No. 3097, P. R. I. H., 14 mm.; g. d., 6.5 mm. Gosport sand: Claiborne, Ala.	319
15.	**Verconella bella** (Conrad) Same as specimen 11	320
16.	**Verconella bella leai**, n. var. No. 3095, P. R. I., syntype. H., 16 mm.; g. d., 6 mm. Gosport sand: Claiborne, Ala.	322
17.	**Cantharus casteri**, n. sp. Same specimen as fig. 13	322

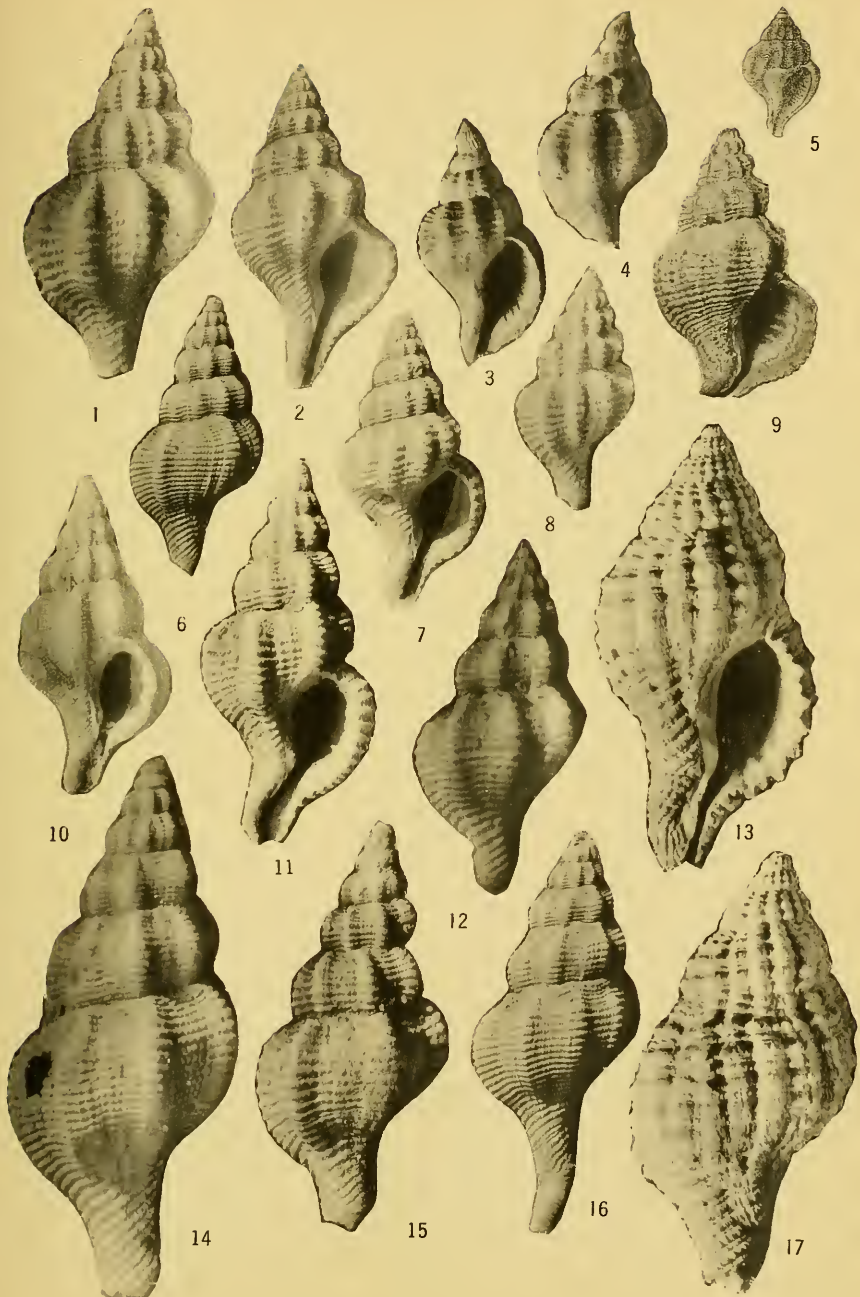

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

PLATE 46

EXPLANATION OF PLATE 46

Figure		Page
1.	**Sycostoma pyrus bulbiforme** (Lamarck) No. 3103, P. R. I. H., 34 mm.; g. d., 18 mm. Lutetian: Damerez, France	325
2.	**Sycostoma enterogramma** (Gabb) No. 3101, P. R. I. H., 91 mm.; g. d., 47 mm. Lower Claiborne: loc. 733	323
3.	**Streptochetus limulus** (Conrad) var. No. 3102, P. R. I. H., 21 mm.; g. d., 12 mm. Gosport sand: Claiborne, Ala.	346
4.	**Streptochetus limulus** (Conrad) var. Same specimen as fig. 3	346
5.	**Sycostoma enterogramma** (Gabb) No. 3104, P. R. I. H., 26 mm.; g. d., 15 mm. Lower Claiborne: loc. 723	323
6.	**Sycostoma pyrus bulbiforme** (Lamarck) No. 3105, P. R. I. H., 60 mm.; g. d., 33 mm. Lutetian: Fleury, France	325
7.	**Sycostoma americanæ**, n. sp. No. 3106, P. R. I. H., 102 mm.; g. d., 65 mm. Lower Claiborne: loc. 734	325
8.	**Sycostoma enterogramma** (Gabb) Same specimen as fig. 5	323
9.	**Sycostoma americanæ**, n. sp. Same specimen as fig. 7	325


1
2
3
4
5
6
7
8
9

PLATE 47

EXPLANATION OF PLATE 47


1
2
3
4
5
6
7
8
9
10
11

PLATE 48

EXPLANATION OF PLATE 48

Figure		Page
1.	**"Fusus" subfilosus** Aldrich Aldrich original drawing	356
2.	**Exilifusus thalloides** (Conrad) No. 3111, P. R. I. H., 36 mm. Gosport sand: Claiborne, Ala.	356
3.	**Levifusus harrisi** Grabau Copy, Grabau	335
4.	**Exilifusus thalloides** (Conrad) Same specimen as fig. 2	356
5.	**Falsifusus ? apicalis** (Johnson) Copy, Johnson	355
6.	**Falsifusus bastropensis** (Harris) No. 2356, P. R. I., holotype. H., 36 mm.	353
7.	**Falsifusus ludovicianus** (Johnson) No. 3113, P. R. I. H., 36 mm.; g. d., 10 mm. Lower Claiborne: loc. 727	354
8.	**Falsifusus ? houstonensis** (Johnson) No. 3114, P. R. I. H., 22 mm.; g. d., 10 mm. Lower Claiborne: loc. 727	354
9.	**"Falsifusus" perobliquus** (Johnson) Holotype, No. 9167, A. N. S.	355
10.	**Falsifusus bastropensis** (Harris) No. 3112, P. R. I. H., 34 mm.; g. d., 14 mm. Lower Claiborne: loc. 733	353
11.	**Falsifusus bastropensis** (Harris) Same specimen as fig. 6	353
12.	**Falsifusus houstonensis** (Johnson) Same specimen as fig. 8	354
13.	**Falsifusus ludovicianus** (Johnson) Same specimen as fig. 7	354

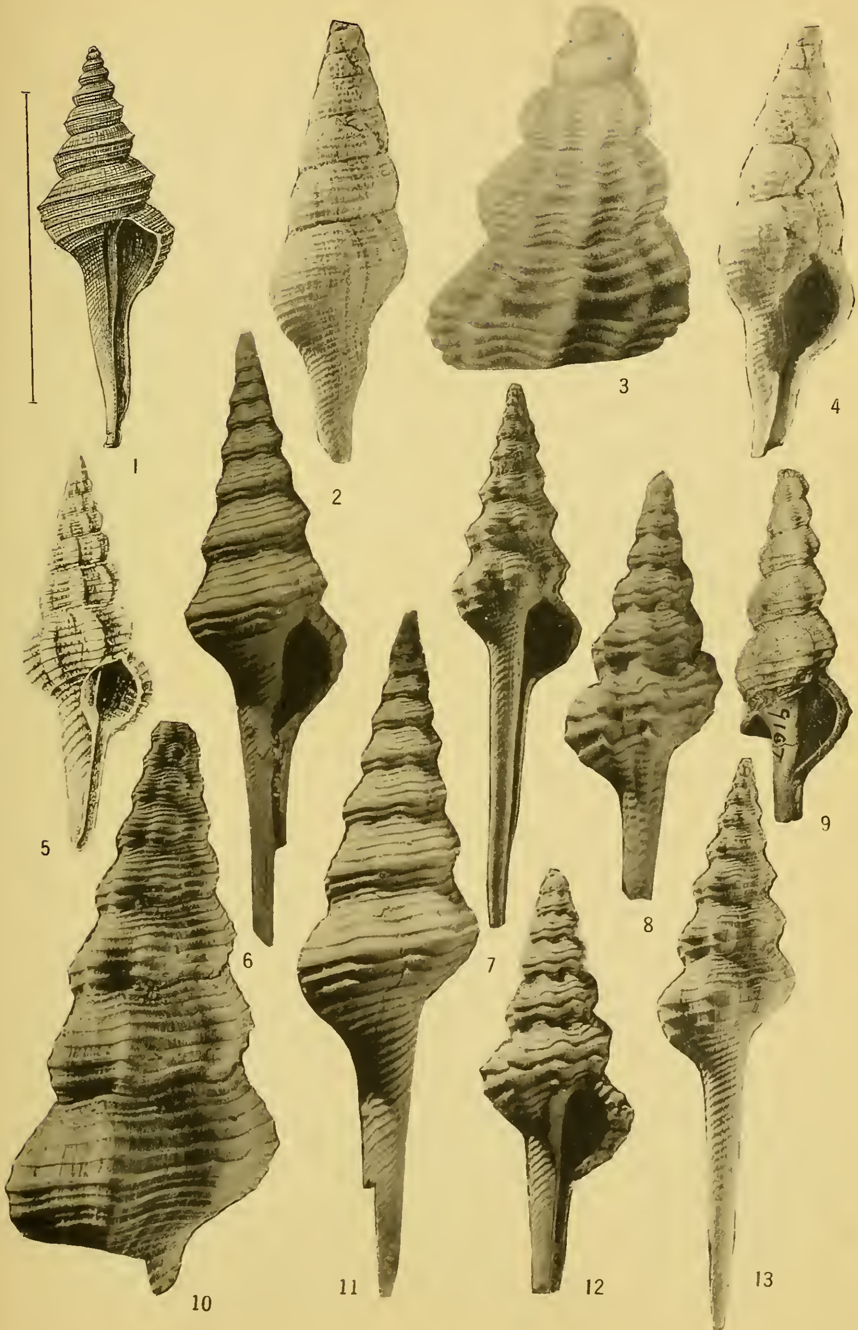

1
2
3
4
5
6
7
8
9
10
11
12
13

PLATE 49

Explanation of Plate 49

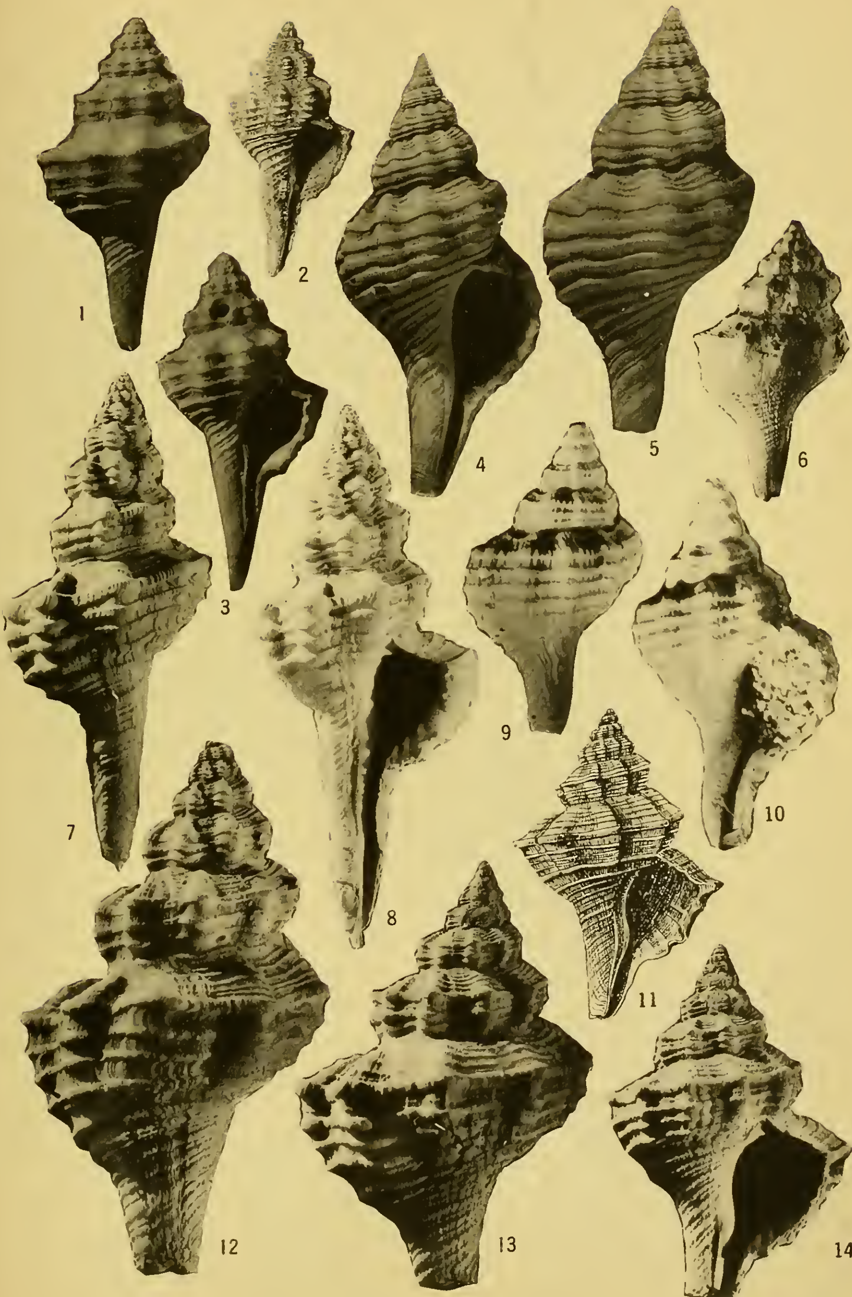

1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 50

EXPLANATION OF PLATE 50

Figure		Page
1.	**Levifusus pagoda** (Heilprin) No. 3122, P. R. I. H., 17 mm.; g. d., 8 mm. Lower Claiborne: loc. 728	333
2.	**Levifusus pagoda prepagoda,** n. var. No. 3123, P. R. I., paratype. H., 33 mm.; g. d., 18 mm. Lower Claiborne: loc. 741	335
3.	**Levifusus pagoda prepagoda,** n. var. No. 3124, P. R. I., paratype. H., 22 mm.; g. d., 12 mm. Lower Claiborne: loc. 741	335
4.	**Levifusus pagoda prepagoda,** n. var. Same specimen as fig. 1	335
5.	**Levifusus pagoda** (Heilprin) No. 3125, P. R. I., H., 27 mm.; g. d., 16 mm. Lower Claiborne: loc. 730	333
6.	**Levifusus pagoda** (Heilprin) Drawing used in Aldrich, 1897, holotype. H., 47 mm.	333
7.	**Levifusus pagoda prepagoda,** n. var. No. 3126, P. R. I., holotype. H., 49 mm.; g. d., 20 mm. Sabine: Woods Bluff, Ala.	335
8.	**Levifusus pagoda** (Heilprin) Same specimen as fig. 5	333
9.	**Levifusus pagoda prepagoda,** n. var. Same specimen as fig. 7	335
10.	**Papillina staminea** (Conrad) No. 3127, P. R. I. H., 38 mm.; g. d., 20 mm. Gosport sand: Claiborne, Ala.	363
11.	**Papillina staminea** (Conrad) No. 3128, P. R. I. H., 35 mm.; g. d., 27 mm. Gosport sand: Claiborne, Ala.	363
12.	**Papillina staminea** (Conrad) No. 3129, P. R. I. H., 26 mm.; g. d., 16 mm. Gosport sand: Claiborne, Ala.	363

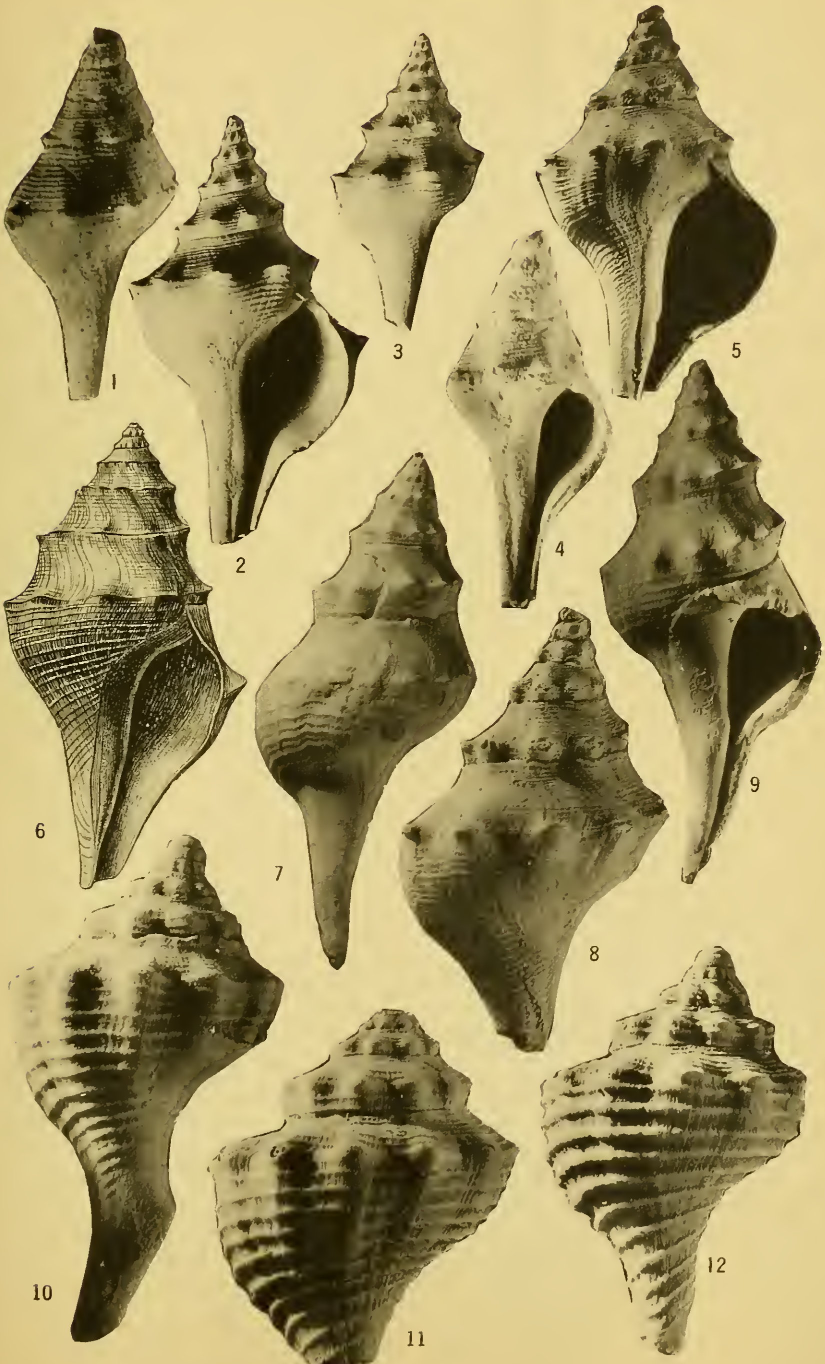

1
2
3
4
5
6
7
8
9
10
11
12

PLATE 51

EXPLANATION OF PLATE 51

Figure		Page
1.	**Levifusus trabeatoides** Harris No. 3130, P. R. I. H., 12 mm.; g. d., 6 mm. Lower Claiborne: loc. 723	327
2.	**Levifusus trabeatoides** Harris No. 3131, P. R. I. H., 24 mm.; g. d., 14 mm. Lower Claiborne: loc. 733	327
3.	**Levifusus trabeatus** (Conrad) No. 3135, P. R. I. H., 51 mm. Gosport sand: Claiborne, Ala.	326
4.	**Levifusus trabeatoides** Harris Same specimen as fig. 2	327
5.	**Levifusus trabeatoides** Harris No. 3134, P. R. I. H., 23 mm.; g. d., 13 mm. Lower Claiborne: loc. 723	327
6.	**Levifusus trabeatus** (Conrad) No. 3136, P. R. I. H., 56 mm.; g. d., 30 mm. Gosport sand: Claiborne, Ala.	326
7.	**Levifusus trabeatoides** Harris No. 3132, P. R. I. H., 8 mm.; g. d., 4 mm. Lower Claiborne: loc. 723	327
8.	**Levifusus trabeatoides** Harris No. 3137, P. R. I. H., 14 mm.; g. d., 12 mm. Lower Claiborne: loc. 741	327
9.	**Levifusus trabeatoides** Harris No. 3133, P. R. I. H., 4 mm.; g. d., 2.5 mm. Young. Lower Claiborne: loc. 723	327
10.	**Papillina altilis** (Conrad) Copy, Conrad	363
11.	**Levifusus trabeatoides** (Harris) Same specimen as fig. 5	327
12.	**Levifusus trabeatoides** (Conrad) Same specimen as fig. 6	326

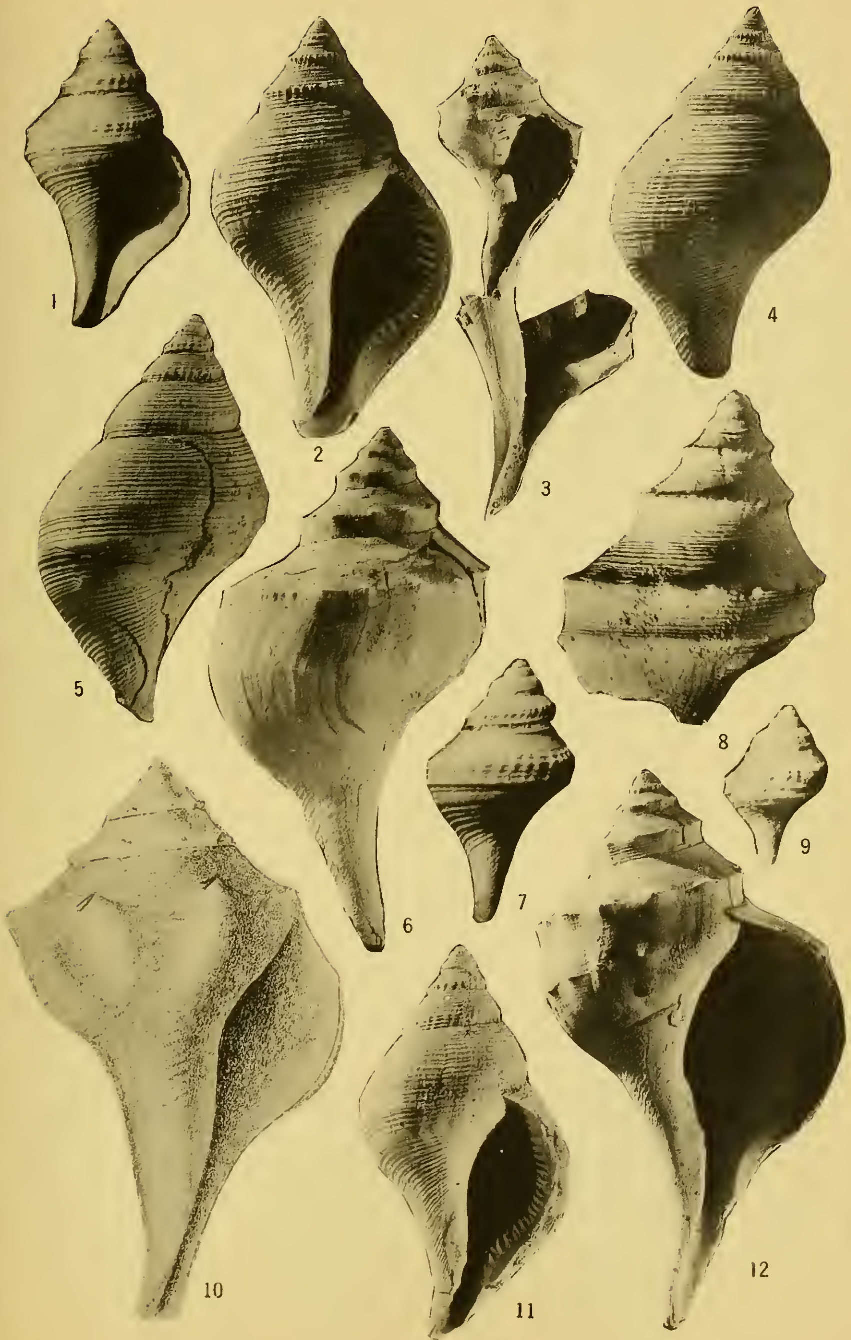

1
2
3
4
5
6
7
8
9
10
11
12

PLATE 52

Explanation of Plate 52


1
2
3
4
5
6
7
8
9
10
11
12

PLATE 53

EXPLANATION OF PLATE 53

Figure		Page
1.	**Lirofusus thoracicus** (Conrad) No. 3149, P. R. I. H., 19 mm.; g. d., 11 mm. Gosport sand: Claiborne, Ala.	348
2.	**Lirofusus thoracicus** (Conrad) No. 3150, P. R. I. H., 23 mm.; g. d., 18 mm. Lower Claiborne: loc. 707	348
3.	**Terebrifusus multiplicatus** (H. C. Lea) No. 3147, P. R. I. H., 6 mm.; g. d., 2.5 mm. Lower Claiborne: loc. 727	308
4.	**Lirofusus thoracicus** (Conrad) Same specimen as fig. 1	348
5.	**Lirofusus thoracicus** (Conrad) No. 3151, P. R. I. H., 8 mm.; g. d., 9 mm. Lower Claiborne: loc. 726	348
6.	**Terebrifusus amœnus** (Conrad) No. 3152, P. R. I. H., 11 mm.; g. d., 4 mm. Lower Claiborne: loc. 728	307
7.	**Terebrifusus amœnus** (Conrad) No. 3153, P. R. I. H., 10 mm.; g. d., 4 mm. Gosport sand: Claiborne, Ala.	307
8.	**Terebrifusus multiplicatus** (H. C. Lea) Same specimen as fig. 3	308
9.	**Terebrifusus amœnus** (Conrad) Same specimen as fig. 6	307
10.	**Terebrifusus amœnus** (Conrad) No. 3154, P. R. I H., 13 mm.; g. d., 5 mm. Gosport sand: loc. 104	307
11.	**Terebrifusus multiplicatus** (Conrad) No. 3148, P. R. I. H., 13 mm.; g. d., 4.5 mm. Lower Claiborne: loc. 727	307
12.	**Lirofusus thoracicus** (Conrad) Same specimen as fig. 2	348
13.	**Terebrifusus amœnus** (Conrad) Same specimen as fig. 10	307
14.	**Terebrifusus multiplicatus** (H. C. Lea) Same specimen as fig. 11	308
15.	**Terebrifusus amœnus** (Conrad) No.3155, P. R. I. H., 16.5 mm.; g. d., 5.5 mm. Lower Claiborne: loc. 734	307
16.	**Terebrifusus amœnus** (Conrad) No. 3156, P. R. I. H., 14 mm.; g. d., 5.5 mm. Lower Claiborne: loc. 734	307

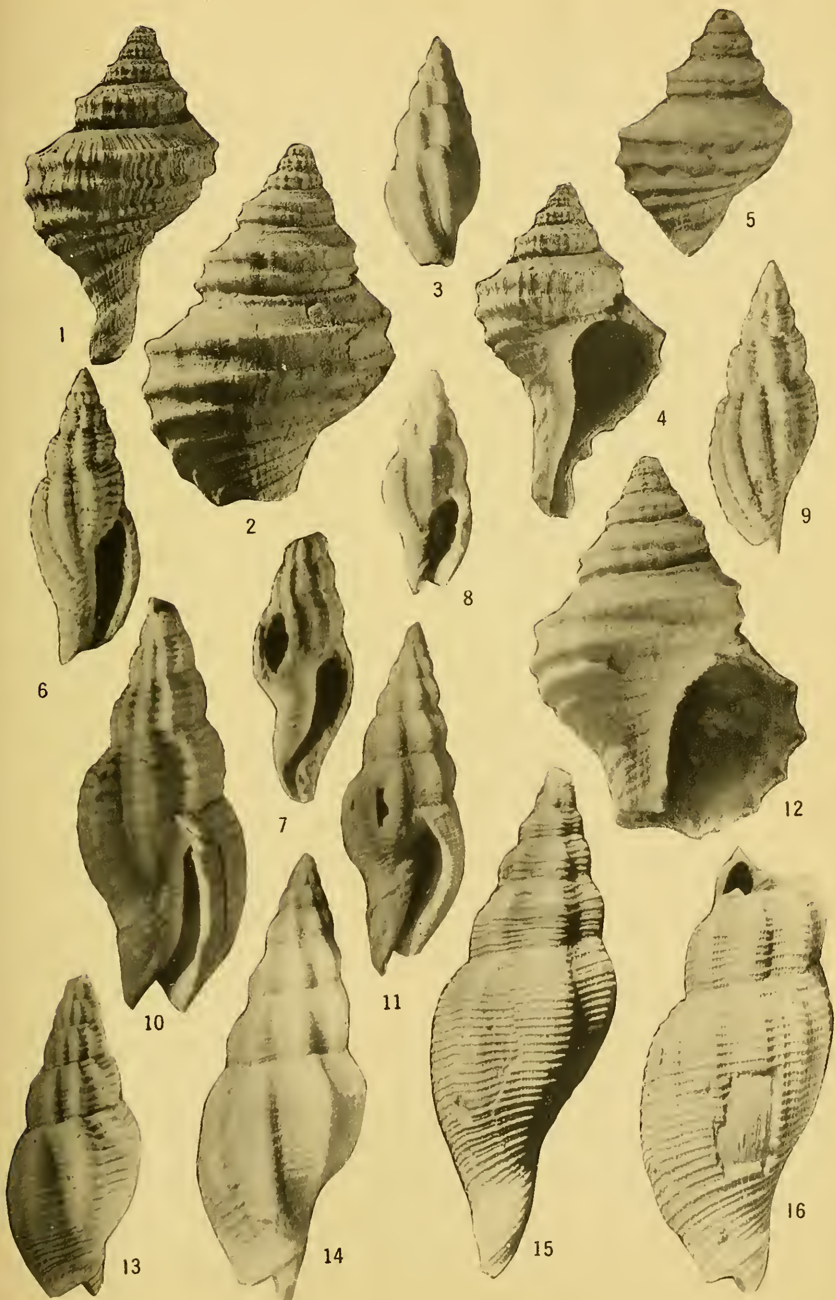

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

PLATE 54

Explanation of Plate 54

Figure		Page
1.	**Latirus (Dolicholatirus) perexilis** (Conrad) **Latirus harrisi** Johnson. Copy, Johnson	344
2.	**Latirus moorei** (Gabb) No. 3160, P. R. I. H., 5.5 mm.; g. d., 3 mm. Lower Claiborne: loc. 741	342
3.	**Latirus sexcostatus** Johnson No. 3158, P. R. I. H., 13 mm.; g. d., 6 mm. Lower Claiborne: loc. 725	343
4.	**Latirus (Dolicholatirus) perexilis** (Conrad) var. No. 3157, P. R. I. H., 18 mm.; g. d., 7 mm. Lower Claiborne: loc. 707	344
5.	**Latirus moorei** (Gabb) No. 3159, P. R. I. H., 3 mm.; g. d., 2 mm. Lower Claiborne: loc. 741	342
6.	**Latirus extricatus** (Casey) Holotype, U. S. Nat. Mus. No. 494,369	344
7.	**Latirus sexcostatus** Johnson Copy, Johnson	343
8.	**Latirus obtusus** Johnson Copy, Johnson	346
9.	**Latirus moorei** (Gabb) No. 3161, P. R. I. H., 25 mm.; g. d., 11 mm. Lower Claiborne: loc. 733	342
10.	**Latirus moorei** (Gabb) Same specimen as fig. 9	342
11.	**Latirus (Dolicholatirus) perexilis** (Conrad) var. Same specimen as fig. 4	344
12.	**Latirus (Dolicholatirus) perexilis** (Conrad) **Latirus singleyi** var. Harris. McConnell drawing specimen figured by Harris, 1895 Lower Claiborne: Hurricane Bayou, near Crockett, Houston Co., Texas	344
13.	**Latirus (Dolicholatirus) perexilis** (Conrad) No. 3163, P. R. I. H., 40 mm.; g. d., 13 mm. Lower Claiborne: loc. 723	345
14.	**Latirus moorei** (Gabb) No. 3162, P. R. I. H., 30 mm.; g. d., 13 mm. Lower Claiborne: loc. 723	342
15.	**Latirus (Dolicholatirus) singleyi** Harris Same specimen as fig. 13	345
16.	**Latirus extricatus** (Casey) No. 3164, P. R. I. H., 17 mm.; g. d., 9 mm. Gosport sand: Claiborne, Ala.	344
17.	**Latirus extricatus** (Casey) Same specimen as fig. 16	344
18.	**Latirus moorei** (Gabb) Same specimen as fig. 14	342

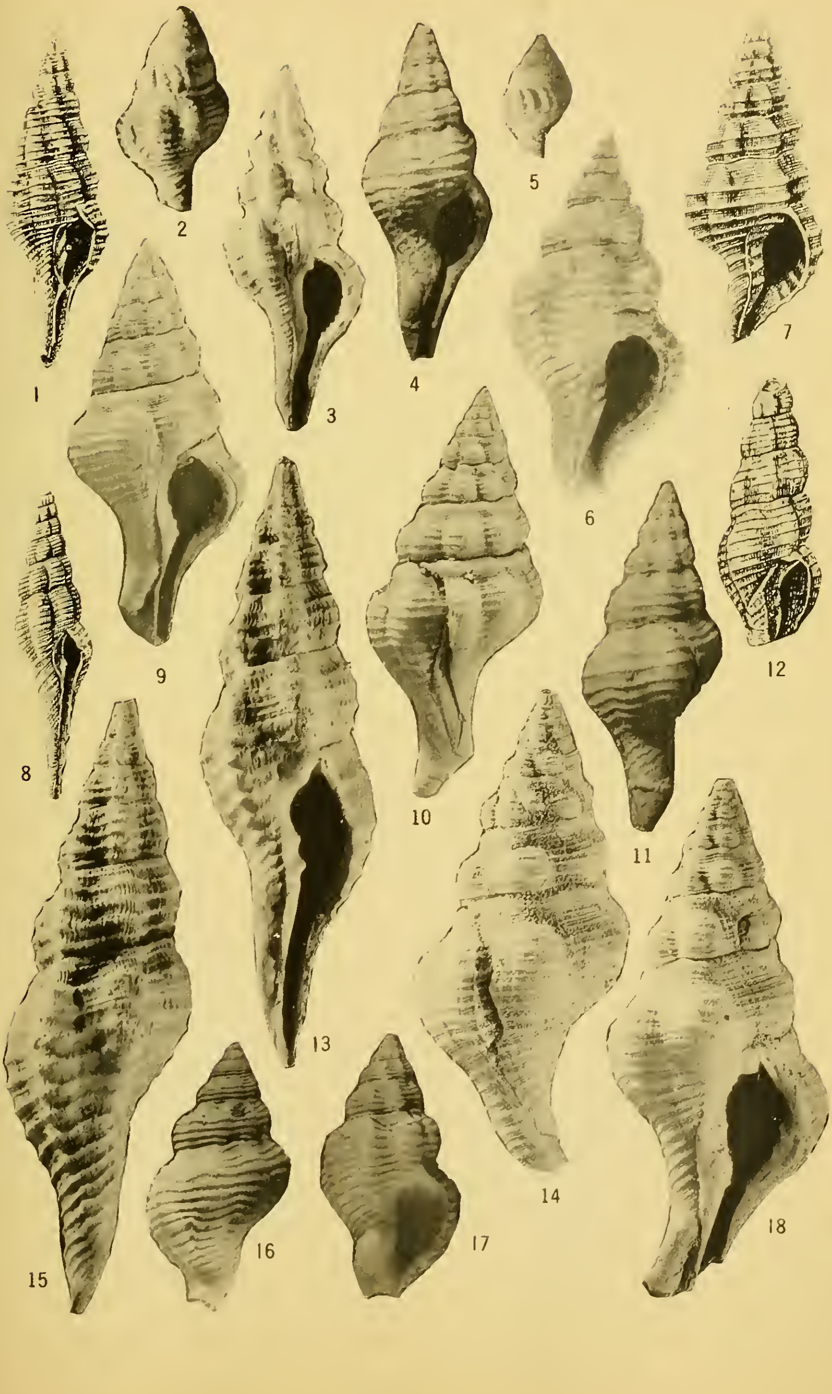

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

PLATE 55

EXPLANATION OF PLATE 55

Figure		Page
1.	**Clavilithes penrosei** (Heilprin) No. 3165, P. R. I. H., 191 mm.; g. d., 113 mm. Lower Claiborne: loc. 733	359
2.	**Clavilithes chamberlaini** Johnson and Grabau Copy, Johnson and Grabau	361
3.	**Clavilithes penrosei** (Heilprin) No. 3166, P. R. I. H., 41 mm.; g. d., 18 mm. Lower Claiborne: loc. 733	359
4.	**Clavilithes penrosei** (Heilprin) No. 3167, P. R. I. H., 77 mm. Lower Claiborne: loc. 733	359
5.	**Clavilithes chamberlaini** Johnson and Grabau Copy, Johnson and Grabau	361
6.	**Clavilithes penrosei** (Heilprin) Same specimen as fig. 3	359
7.	**Clavilithes regexus** Harris McConnell drawing, holotype Lower Claiborne: Berryman place, Cherokee Co., Texas	360

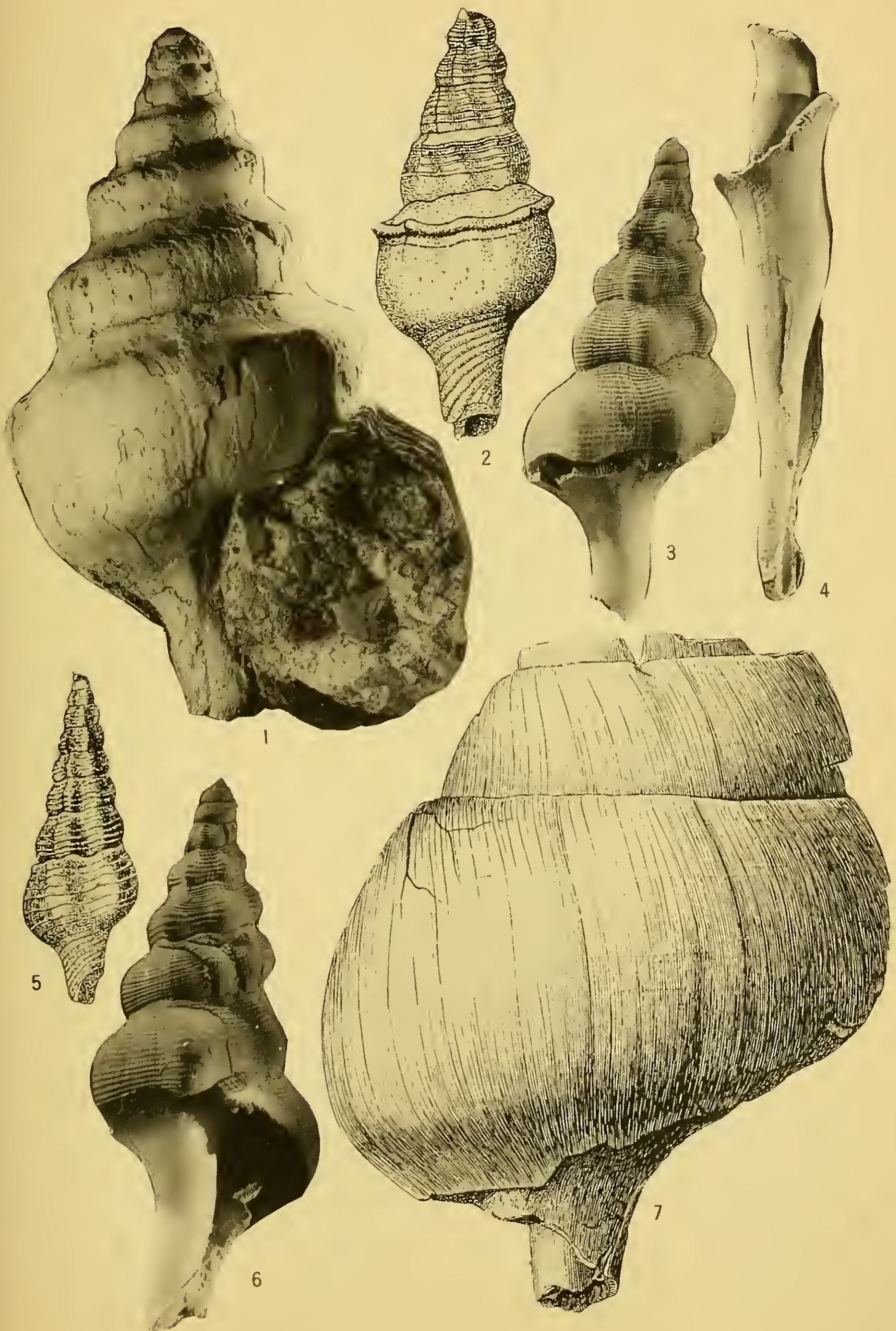

1
2
3
4
5
6
7

PLATE 56

EXPLANATION OF PLATE 56

Figure		Page
1.	**Clavilithes pachyleurus** (Conrad) No. 3168, P. R. I. H., 60 mm.; g. d., 13 mm. Gosport sand: Claiborne, Ala.	358
2.	**Clavilithes pachyleurus** (Conrad) Same specimen as fig. 1	358
3.	**Clavilithes texanus** Harris No. 3169, P. R. I. H., 46 mm.; g. d., 14 mm. Lower Claiborne: loc. 741	362
4.	**Clavilithes kennedyanus** Harris No. 3170, P. R. I. H., 26 mm.; g. d., 10 mm. Immature. Lower Claiborne: loc. 731	360
5.	**Clavilithes columbaris** Aldrich Copy, Aldrich	362
6.	**Clavilithes kennedyanus** Harris No. 3171, P. R. I. H., 37 mm.; g. d., 10 mm. Immature. Lower Claiborne: loc. 731	360
7.	**Clavilithes kennedyanus** Harris Same specimen as fig. 6	360
8.	**Clavilithes humerosus** Conrad No. 3172, P. R. I. H., 53 mm.; g. d., 23 mm. Jackson: Jackson, Miss.	362
9.	**Clavilithes raphanoides** (Conrad) Copy, Conrad, 1835	357
10.	**Clavilithes ? protextus** (Conrad) Copy, Conrad, 1835	357
11.	**Clavilithes kennedyanus** Harris No. 3173, P. R. I. H., 32 mm.; g. d., 15 mm. Lower Claiborne: loc. 730	360
12.	**Clavilithes texanus** Harris Same specimen as fig. 3	362
13.	**Clavilithes kennedyanus** Harris McConnell drawing, holotype	360

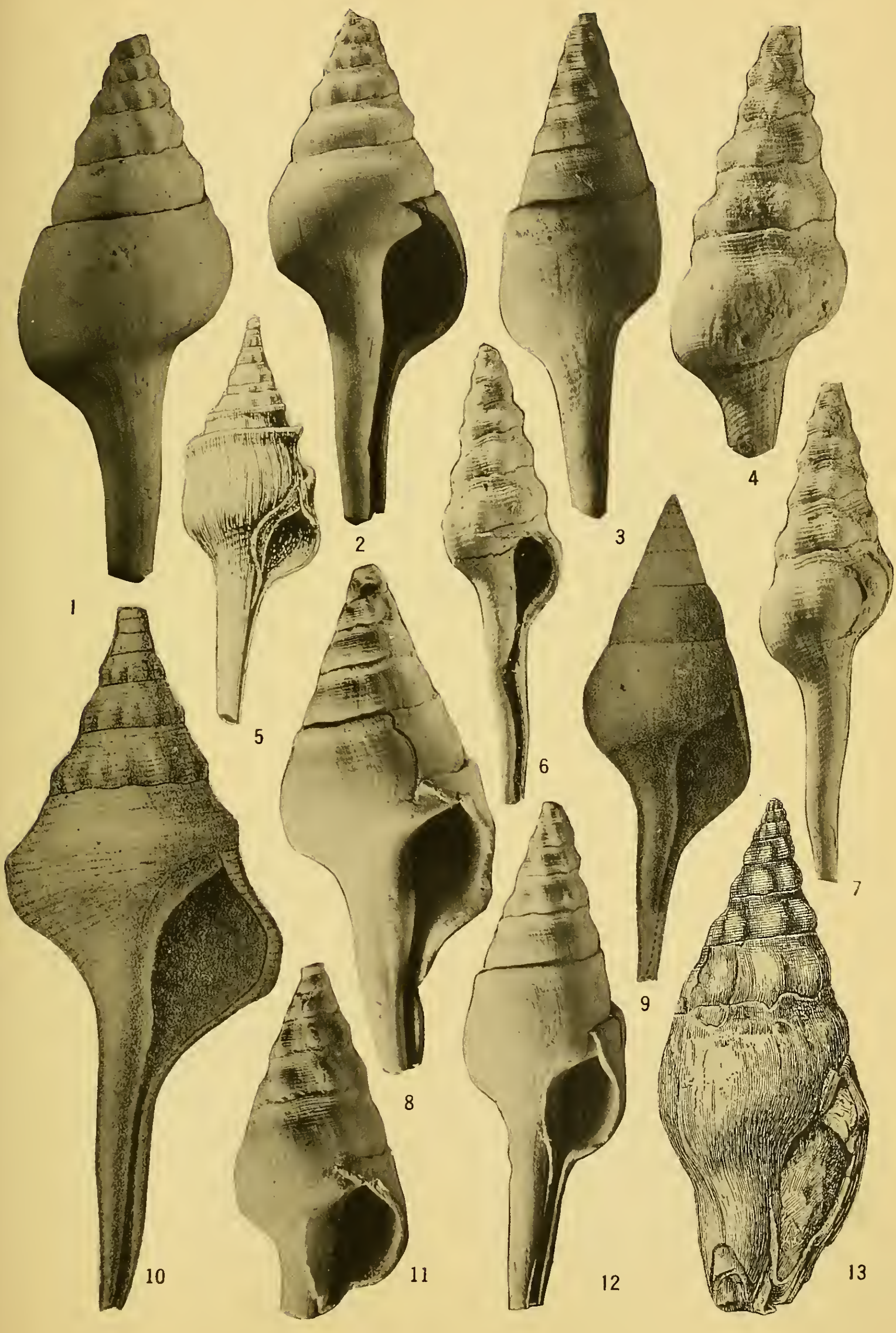


PLATE 57

Explanation of Plate 57

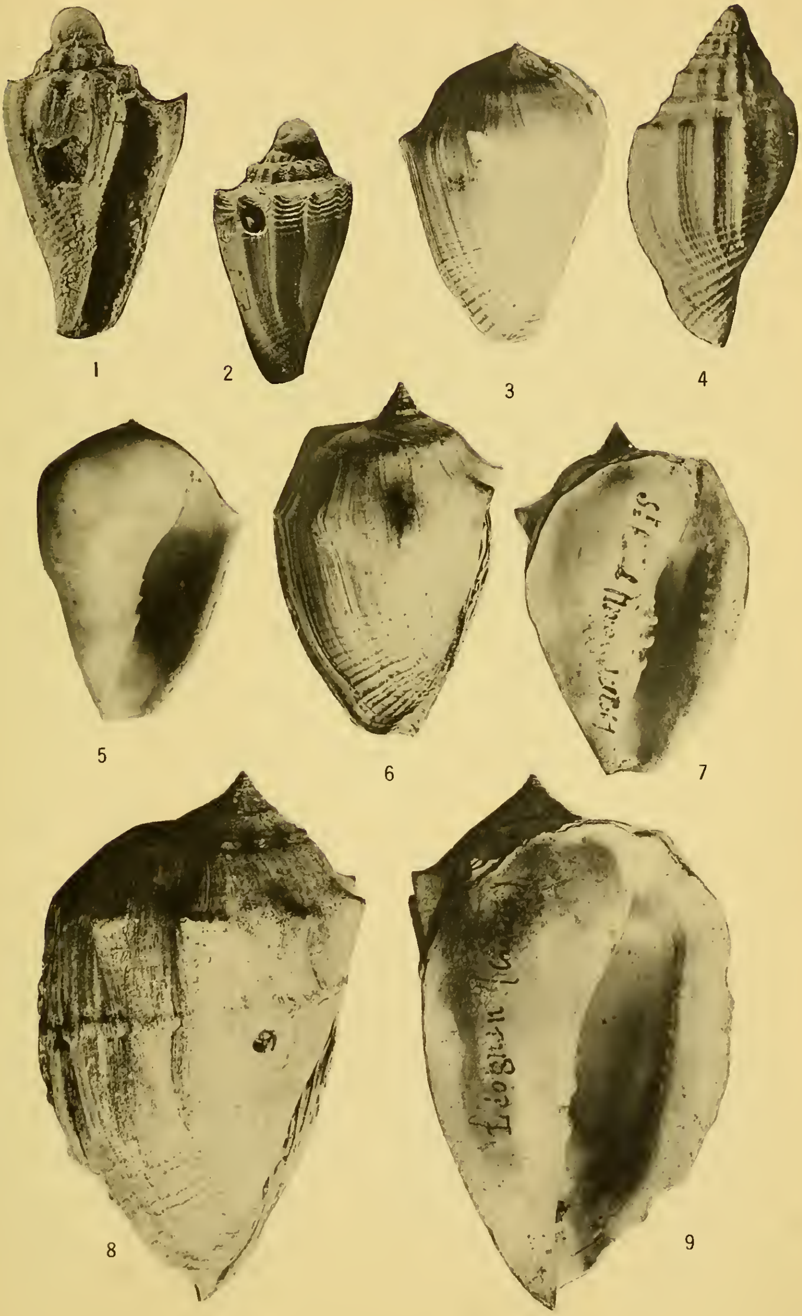

1
2
3
4
5
6
7
8
9

PLATE 58

EXPLANATION OF PLATE 58

Figure	Page
1. **Athleta petrosa** (Conrad) .... 372 No. 3175, P. R. I. H., 38 mm.; g. d., 20 mm. Jackson Eocene
2. **Athleta petrosa** (Conrad) .... 372 No. 3178, P. R. I. H., 28 mm.; g. d., 13 mm. Gosport sand: Claiborne, Ala.
3. **Athleta petrosa** (Conrad) .... 372 No. 3180, P. R. I. H., 36 mm.; g. d., 28 mm. Lower Claiborne: loc. 733
4. **Athleta petrosa** (Conrad) .... 372 No. 3179, P. R. I. H., 26 mm.; g. d., 13 mm. Gosport sand: Claiborne, Ala.
5. **Athleta petrosa indenta** (Conrad) .... 375 No. 3181, P. R. I. H., 13 mm.; g. d., 6 mm. Lower Claiborne: loc. 723
6. **Athleta petrosa** (Conrad) .... 375 No. 3182, P. R. I. H., 25 mm.; g. d., 13 mm. Lower Claiborne: loc. 723
7. **Athleta petrosa indenta** (Conrad) .... 375 **Volutilithes indentus** Conrad. Copy, Conrad, 1865
8. **Athleta petrosa** (Conrad) .... 372 Same specimen as fig. 5
9. **Athleta petrosa** (Conrad) .... 372 No. 3176, P. R. I. H., 40 mm.; g. d., 18 mm. Jackson Eocene
10. **Athleta petrosa** (Conrad) .... 372 Same specimen as fig. 9
11. **Athleta petrosa** (Conrad) .... 372 **Athleta tuomeyi** Conrad. Part of callus broken to show normal shell beneath. No. 3183, P. R. I. H., 33 mm.; g. d., 18 mm. Sabine: Woods Bluff, Ala.
12. **Athleta petrosa** (Conrad) .... 372 No. 3184, P. R. I. H., 20 mm.; g. d., 10 mm. Sabine: Woods Bluff, Ala.
13. **Athleta petrosa** (Conrad) .... 372 No. 3185, P. R. I. H., 33 mm.; g. d., 15 mm. Sabine: Woods Bluff, Ala.
14. **Athleta petrosa** (Conrad) .... 372 No. 3177, P. R. I. H., 35 mm.; g. d., 18 mm. Jackson Eocene

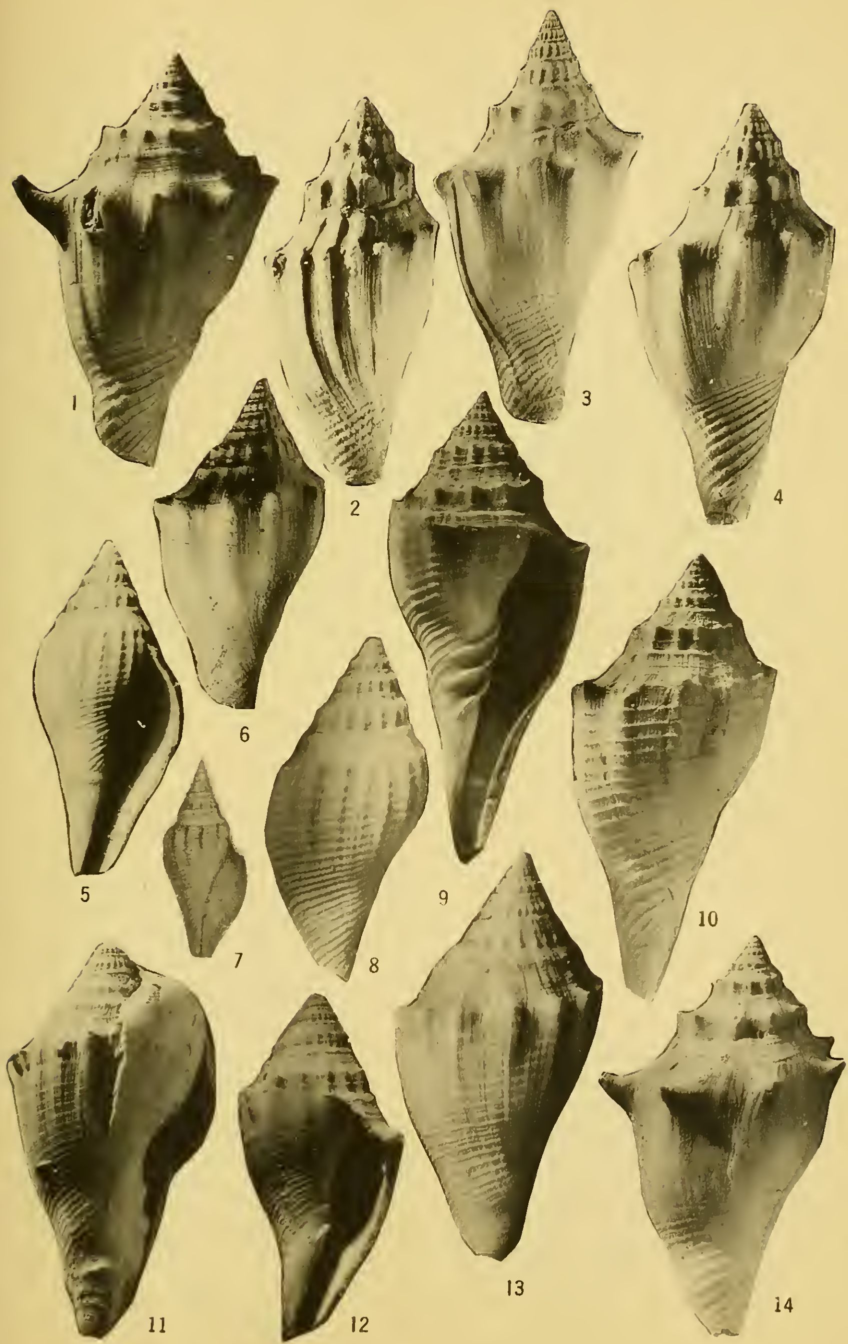

1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 59

EXPLANATION OF PLATE 59

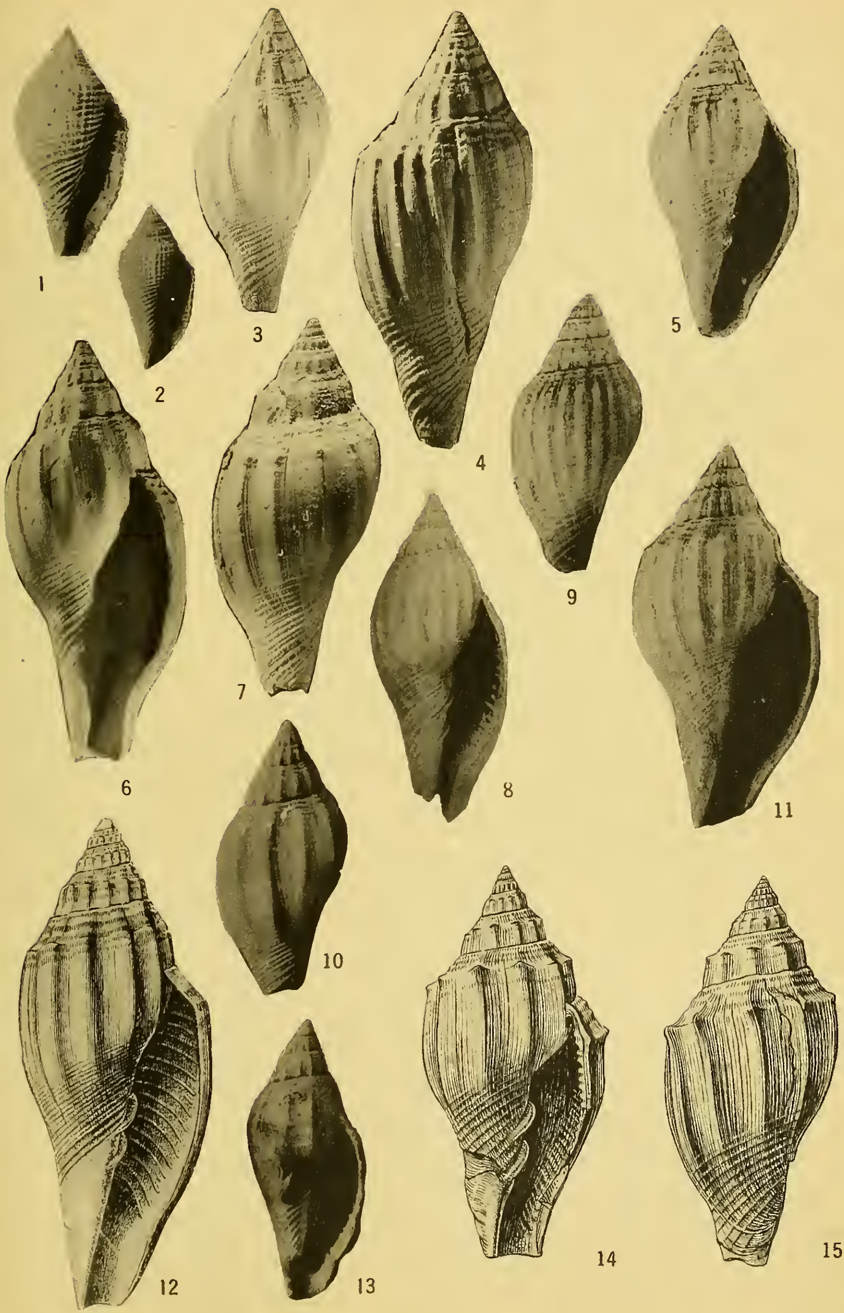

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

PLATE 60

EXPLANATION OF PLATE 60

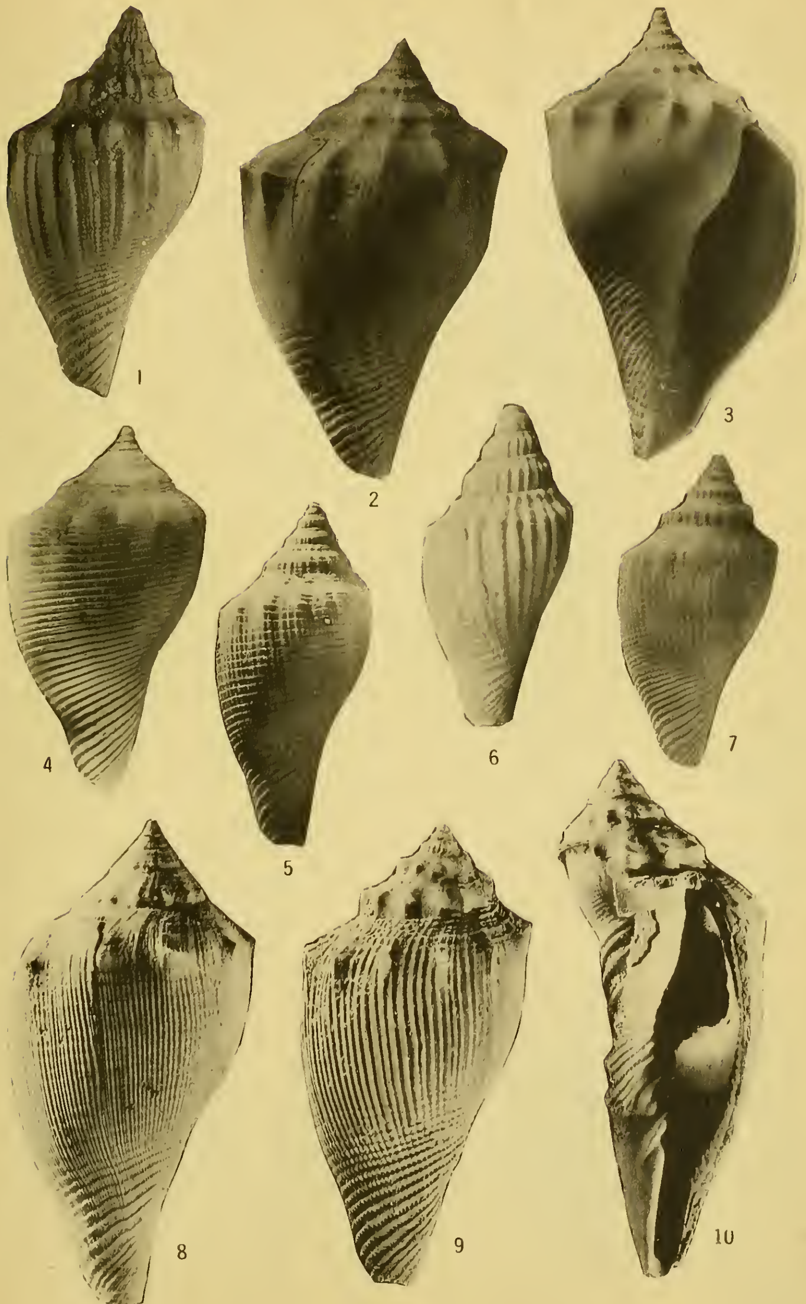

1
2
3
4
5
6
7
8
9
10

PLATE 61

EXPLANATION OF PLATE 61

Figure		Page
1.	**Caricella** sp. No. 3198, P. R. I. H., 11 mm.; g. d., 6 mm. Lower Claiborne: loc. 731	398
2.	**Athleta clayi** Smith Copy, Smith	378
3.	**Athleta clayi** Smith Copy, Smith	378
4.	**Athleta clayi** Smith Copy, Smith	378
5.	**Athleta haleanus** (Whitfield) Holotype. Walker Museum, Univ. Chicago	379
6.	**Athleta haleanus** (Whitfield) Holotype. Walker Museum, Univ. Chicago	379
7.	**Athleta haleanus** (Whitfield) No. 3199, P. R. I. H., 25 mm.; g. d., 11 mm. Lower Claiborne: loc. 734	379
8.	**Athleta haleanus** (Whitfield) Same specimen as fig. 7	379
9.	**Athleta dalli smithvillensis** (Plummer) Copy, Plummer	383
10.	**Athleta dalli smithvillensis** (Plummer) Copy, Plummer	383
11.	**Athleta dalli** (Harris) No. 3200, P. R. I. H., 26 mm.; g. d., 13 mm. Lower Claiborne: loc. 733	382
12.	**Athleta dalli** (Harris) Same specimen as fig. 11	382
13.	**Athleta dalli** (Harris) McConnell drawing, holotype. H., 34 mm. Lower Claiborne: Smithville, Bastrop Co., Texas	382
14.	**Athleta dalli** (Harris) var. McConnell drawing. H., 34 mm. Lower Claiborne: Smithville, Bastrop Co., Texas	382

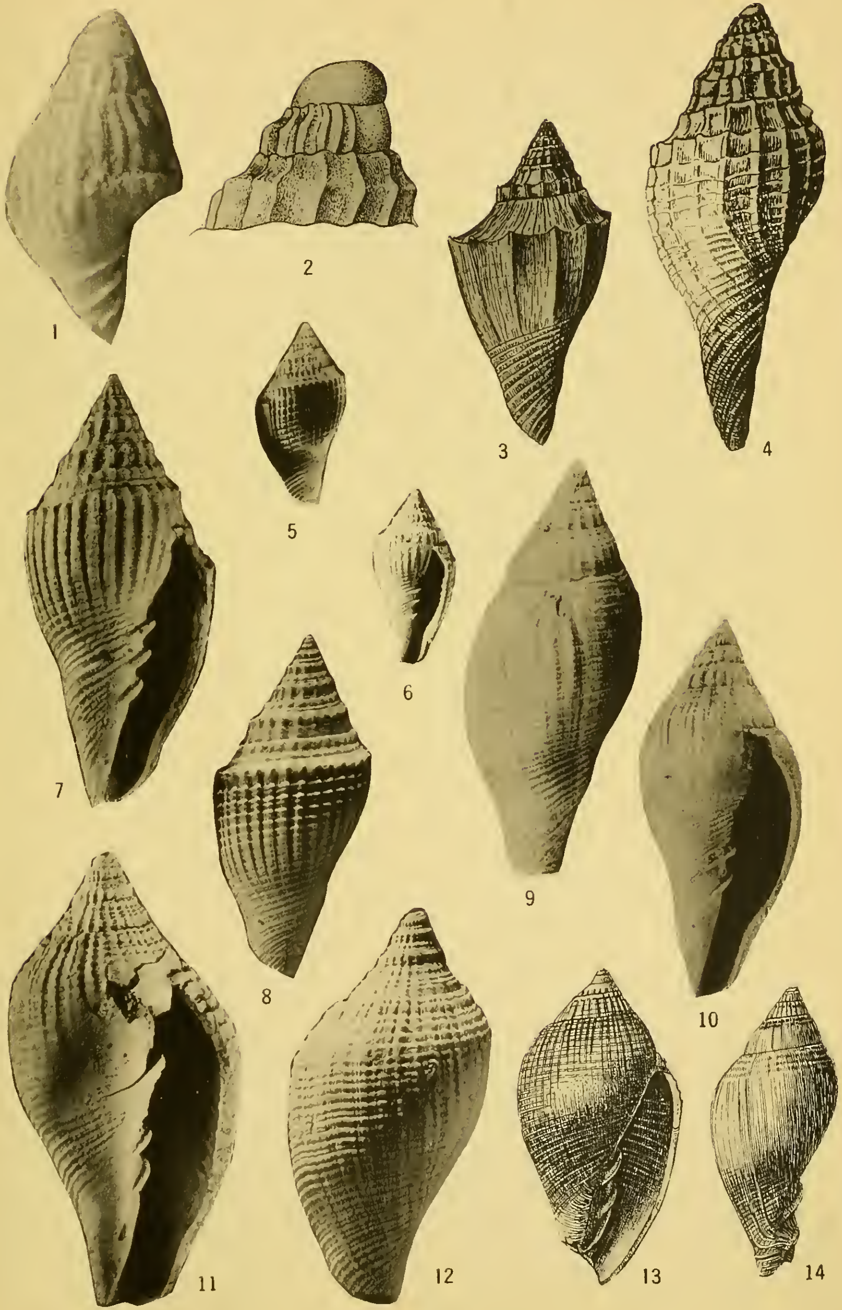

1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 62

EXPLANATION OF PLATE 62

Figure		Page
1.	**Lapparia dumosa** (Conrad) No. 3201, P. R. I. H., 40 mm.; g. d., 16 mm. Jackson: Montgomery, La.	386
2.	**Lapparia dumosa exigua**, n. var. No. 3202, P. R. I., syntype. H., 31 mm.; g. d., 13 mm. Jackson: ½ mile below Gibson's Landing, La.	386
3.	**Lapparia dumosa** (Conrad) No. 3204, P. R. I. H., 35 mm.; g. d., 15 mm. Jackson Eocene	386
4.	**Lapparia pactilis** (Conrad) No. 3205, P. R. I. H., 9 mm.; g. d., 5 mm. Young. Gosport sand: Claiborne, Ala.	385
5.	**Lapparia dumosa exigua**, n. var. No. 3203, P. R. I., syntype. H., 32 mm.; g. d., 14 mm. Jackson: Montgomery, La.	386
6.	**Lapparia pactilis** (Conrad) No. 3207, P. R. I. H., 33 mm.; g. d., 14 mm. Gosport sand: Claiborne, Ala.	385
7.	**Lapparia pactilis** (Conrad) No. 3206, P. R. I. H., 33 mm.; g. d., 12 mm. Gosport sand: Claiborne, Ala.	385
8.	**Lapparia mooreana** (Gabb) No. 3208, P. R. I. H., 40 mm.; g. d., 15 mm. Lower Claiborne: loc. 733	387
9.	**Lapparia mooreana** (Gabb) No. 3209, P. R. I. H., 24 mm.; g. d., 10 mm. Lower Claiborne: loc. 725	387
10.	**Lapparia mooreana** (Gabb) No. 3210, P. R. I. H., 25 mm.; g. d., 14 mm. Lower Claiborne: loc. 733	387
11.	**Lapparia mooreana** (Gabb) No. 3211, P. R. I. H., 24 mm.; g. d., 10 mm. Lower Claiborne: loc. 725	387
12.	**Lapparia mooreana** (Gabb) No. 3212, P. R. I. H., 50 mm.; g. d., 15 mm. Lower Claiborne: loc. 733	387
13.	**Lapparia mooreana** (Gabb) No. 3213, P. R. I. H., 36 mm.; g. d., 12 mm. Lower Claiborne: loc. 733	387
14.	**Lapparia mooreana** (Gabb) Same specimen as fig. 9	387
15.	**Lapparia mooreana** (Gabb) No. 3214, P. R. I. H., 20 mm.; g. d., 9 mm. Lower Claiborne: loc. 725	387
16.	**Lapparia mooreana** (Gabb) No. 3215, P. R. I. H., 8 mm.; g. d., 3.5 mm. Young. Lower Claiborne: loc. 727	387

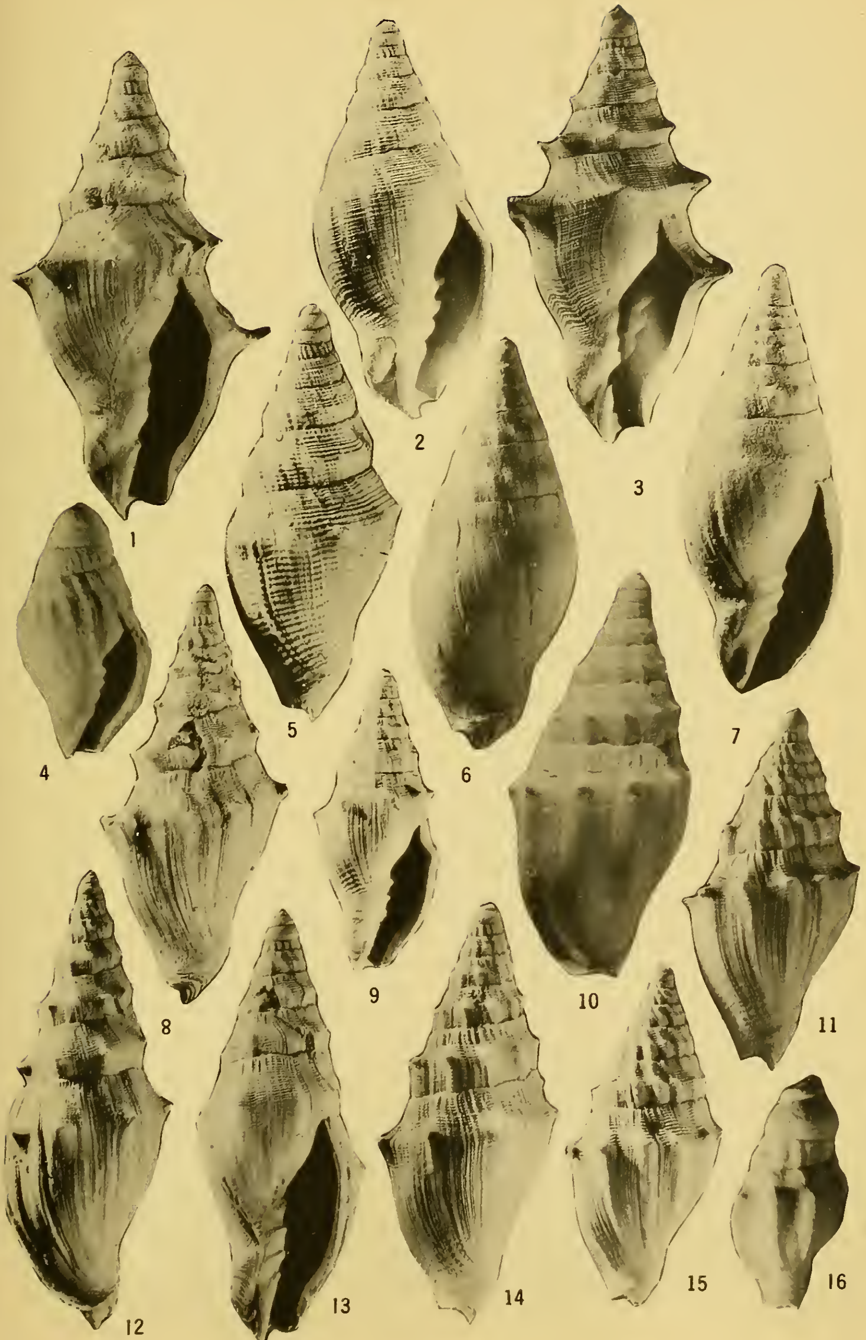

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

PLATE 63

EXPLANATION OF PLATE 63

Figure		Page
1.	**Caricella pyruloides** (Conrad) No. 3216, P. R. I. H., 41 mm.; g. d., 21 mm. Gosport sand: Claiborne, Ala.	390
2.	**Caricella pyruloides** (Conrad) No. 3217, P. R. I. H., 25 mm.; g. d., 12 mm. Young. Gosport sand: Claiborne, Ala.	390
3.	**Caricella pyruloides** (Conrad) Same specimen as fig. 2	390
4.	**Caricella pyruloides polita** Conrad No. 3218, P. R. I. H., 35 mm.; g. d., 18 mm. Jackson Eocene	391
5.	**Caricella subangulata cherokeensis** Harris McConnell drawing, holotype. Lower Claiborne: W. Lewis house on old San Antonio road, 2 miles east of Alto, Cherokee Co., Texas	396
6.	**Caricella pyruloides** (Conrad) No. 3219, P. R. I. H., 61 mm.; g. d., 46 mm. Gosport sand: Claiborne, Ala.	390
7.	**Caricella pyruloides polita** Conrad Same specimen as fig. 4	391
8.	**Caricella subangulata cherokeensis** Harris No. 3220, P. R. I. H., 30 mm.; g. d., 20 mm. Lower Claiborne: loc. 727	396
9.	**Caricella pyruloides** (Conrad) No. 3221, P. R. I. H., 62 mm.; g. d., 42 mm. Gosport sand: Claiborne, Ala.	390
10.	**Caricella pyruloides** (Conrad) No. 3222, P. R. I. H., 15 mm.; g. d., 8 mm. Young. Gosport sand: Claiborne, Ala.	390
11.	**Caricella pyruloides** (Conrad) No. 3223, P. R. I H., 16 mm.; g. d., 8 mm. Young. Gosport sand. Claiborne, Ala.	390
12.	**Caricella pyruloides** (Conrad) Same specimen as fig. 1	390


1
2
3
4
5
6
7
8
9
10
11
12

PLATE 64

EXPLANATION OF PLATE 64


1
2
3
4
5
6
7
8
9
10
11

PLATE 65

Explanation of Plate 65

Figure		Page
1.	**Volvaria alabamiensis** Cossmann No. 3232, P. R. I. H., 7.5 mm.; g. d., 3 mm. Gosport sand: Claiborne, Ala.	412
2.	**Volvaria gabbiana** Harris	412

McConnell drawing, holotype. H., 9 mm.
Lower Claiborne: Colorado River, bluff just below the mouth of Alum Creek, not far above Smithville, Bastrop Co., Texas

3. **Volvariella aldrichi** Cossmann 413
No. 3231, P. R. I. H., 8 mm.; g. d., 2.5 mm.
Gosport sand: Claiborne, Ala.

4. **Volvariella aldrichi** Cossmann 413
Copy **V. alabamensis** Aldrich. H., 6.5 mm.
Sabine: Woods Bluff, Ala.

5. **Volaria reticulata** Johnson 413
No. 3233, P. R. I. H., 4.5 mm.; g. d., 2 mm.
Lower Claiborne: loc. 741

6. **Harpa,** sp. 398
No. 3235, P. R. I. H., 14 mm.
Lower Claiborne: loc. 725

7. **Volvaria alabamiensis** Cossmann 412
Same specimen as fig. 1

8. **Caricella demissa texana** (Gabb) 395
McConnell drawing in Harris, 1895. H., 34 mm.
Lower Claiborne: Texas

9. **Cryptochorda mohri** (Aldrich) 399
No. 3236, P. R. I. H., 40 mm.; g. d., 19 mm.
Lower Claiborne: loc. 733

10. **Cryptochorda mohri** (Aldrich) 399
Same specimen as fig. 9

11. **Volvaria reticulata** Johnson 413
No. 3234, P. R. I. H., 5 mm.; g. d., 3 mm.
Lower Claiborne: loc. 741

12. **Caricella reticulata** Aldrich 397
No. 3238, P. R. I. H., 30 mm.; g. d., 14 mm.
Vicksburg Oligocene: Red Bluff, Ala.

13. **Caricella reticulata** Aldrich 397
No. 3239, P. R. I. H., 15.5 mm.; g. d., 7 mm.
Vicksburg Oligocene: Red Bluff, Ala.

14. **Caricella demissa texana** (Gabb) 395
No. 3237, P. R. I. H., 35 mm.; g. d., 14 mm.
Lower Claiborne: loc. 730

15. **Caricella demissa texana** (Gabb) 395
Same specimen as fig. 14

16. **Volvaria reticulata** Johnson 413
Copy, Johnson

17. **Caricella reticulata stenzeli,** n. var. 397
No. 3240, P. R. I., syntype. H., 44 mm.; g. d., 25 mm.
Lower Claiborne: loc. 731

18. **Caricella reticulata stenzeli,** n. var. 397
No. 3241, P. R. I., syntype. H., 22 mm.; g. d., 9 mm.
Lower Claiborne: loc. 731

19. **Caricella reticulata stenzeli,** n. var. 397
No. 3242, P. R. I., syntype. H., 21.5 mm.; g. d., 10 mm.
Lower Claiborne: loc. 731

20. **Caricella reticulata stenzeli,** n. var. 397
No. 3243, P. R. I., syntype. H., 26 mm.; g. d., 11 mm.
Lower Claiborne: loc. 731

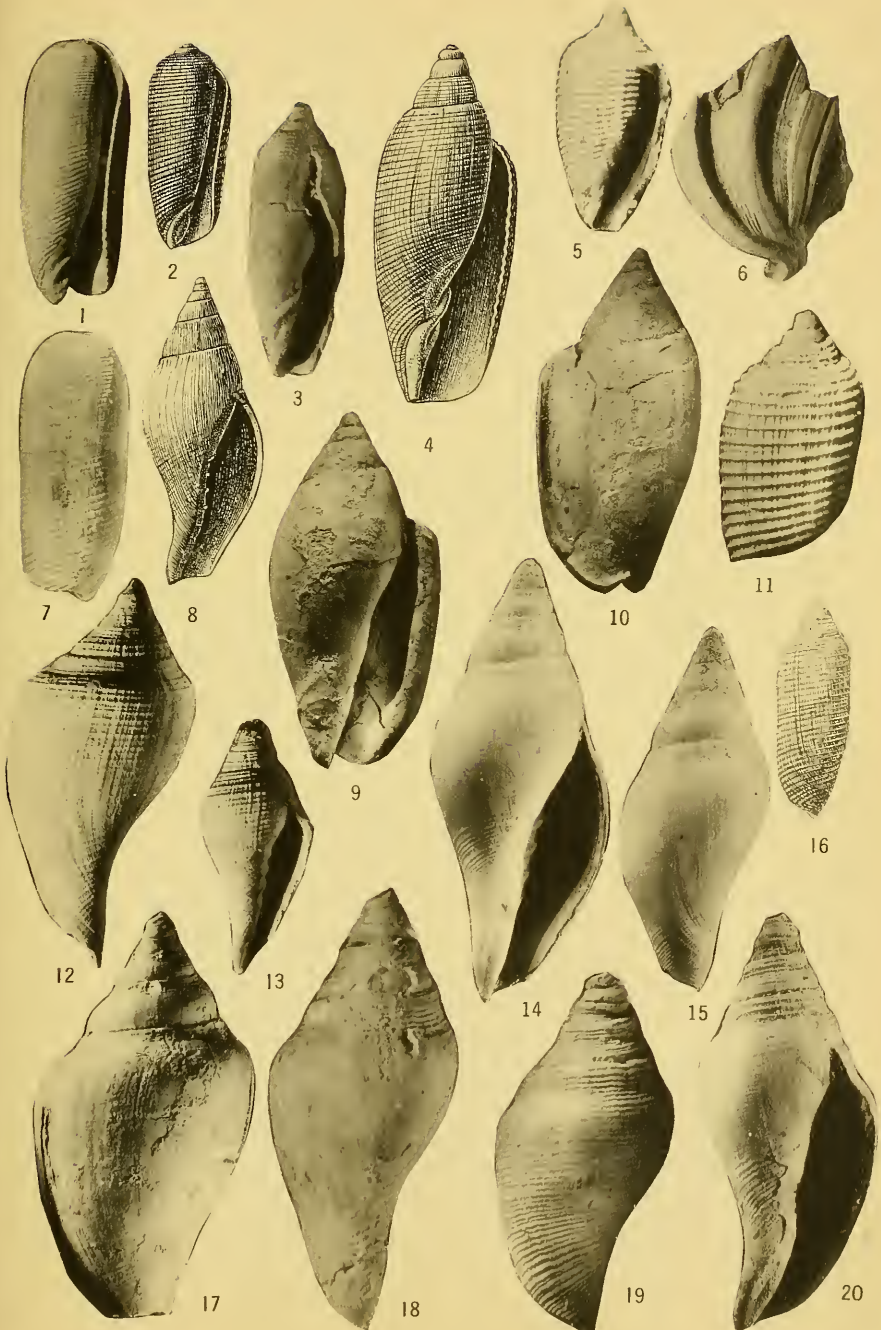

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

PLATE 66

Explanation of Plate 66

Figure		Page
1.	**Vexillum (Uromitra) gracile** (H. C. Lea) No. 3253, P. R. I. H., 3 mm.; g. d., 1 mm. Gosport sand: Claiborne, Ala.	402
2.	**Vexillum (Uromitra) exile** (Gabb) No. 3245, P. R. I. H., 7.5 mm.; g. d., 2 mm. Lower Claiborne: loc. 727	403
3.	**Vexillum (Uromitra) exile** (Gabb) No. 3246, P. R. I. H., 7 mm.; g. d., 2 mm. Lower Claiborne: loc. 727	403
4.	**Mitrolumna eocenensis** (Aldrich) No. 3244, P. R. I. H., 4 mm.; g. d., 2 mm. Gosport sand: Claiborne, Ala.	414
5.	**Mitrolumna eocenensis** (Aldrich) Copy, Aldrich	414
6.	**Mitrolumna eocenensis** (Aldrich) Same specimen as fig. 4	414
7.	**Fusimitra perexilis** (Conrad) No. 3247, P. R. I. H., 7.5 mm.; g. d., 3 mm.	405
8.	**Fusimitra perexilis** (Conrad) Same specimen as fig. 7	405
9.	**Vexillum (? Uromitra) terplicatum** (de Gregorio) Copy, De Gregorio	401
10.	**Vexillum (? Uromitra) terplicatum** (de Gregorio) Copy, De Gregorio	401
11.	**Fusimitra adamsi, n. sp.** No. 3249, P. R. I., holotype. H., 8 mm.; g. d., 2.5 mm.	407

Lower Claiborne: loc. 733

12. **Conomitra texana orangeburgensis**, n. sp. 410
No. 3251, P. R. I., syntype. H., 7 mm.; g. d., 2.5 mm.
Claibornian: loc. 136

13. **Vexillum (Uromitra) gracile** (H. C. Lea) 402
No. 3254, P. R. I. H., 11 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

14. **Vexillum (Uromitra) gracile** (H. C. Lea) 402
Same specimen as fig. 13

15. **Conomitra texana orangeburgensis**, n. sp. 410
No. 3252, P. R. I. H., 6 mm.; g. d., 3 mm.
Claibornian: loc. 136

16. **Fusimitra perexilis** (Conrad) 405
No. 3248, P. R. I. H., 14 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

17. **Fusimitra polita** (Gabb) 407
No. 3255, P. R. I. H., 40 mm.; g. d., 9 mm.
Lower Claiborne: loc. 733

18. **Fusimitra polita** (Gabb) 407
Same specimen as fig. 17

19. **Conomitra fusoides** (Lea) 408
No. 3256, P. R. I. H., 5.5 mm.; g. d., 2.5 mm.
Gosport sand: Claiborne, Ala.

20. **Conomitra texana** Harris 410
McConnell drawing, holotype. H., 6 mm.
Lower Claiborne: Hurricane Bayou, Marston's survey, near Crockett, Houston Co., Texas

21. **Conomitra texana** Harris 410
No. 3261, P. R. I. H., 7 mm.; g. d., 3 mm.
Lower Claiborne: loc. 727

22. **Conomitra texana** Harris 410
No. 3262, P. R. I. H., 8 mm.; g. d., 3 mm.
Lower Claiborne: loc. 727

23. **Conomitra fusoides lepa** de Gregorio 409
No. 3258, P. R. I. H., 8 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

24. **Conomitra fusoides** (Lea) 408
No. 3257, P. R. I. H., 10 mm.; g. d., 5.5 mm.
Gosport sand: Claiborne, Ala.

25. **Conomitra fusoides** (Lea) 408
Holotype, A. N. S.

26. **Conomitra fusoides** (Lea) 408
Same specimen as fig. 24

27. **Conomitra fusoides lepa** de Gregorio 409
No. 3259, P. R. I. H., 9 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

28. **Conomitra usoides lepa** de Gregorio 409
No. 3260, P. R. I. H., 8 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

29. **Conomitra polita** Vaughan 411
Copy, Vaughan

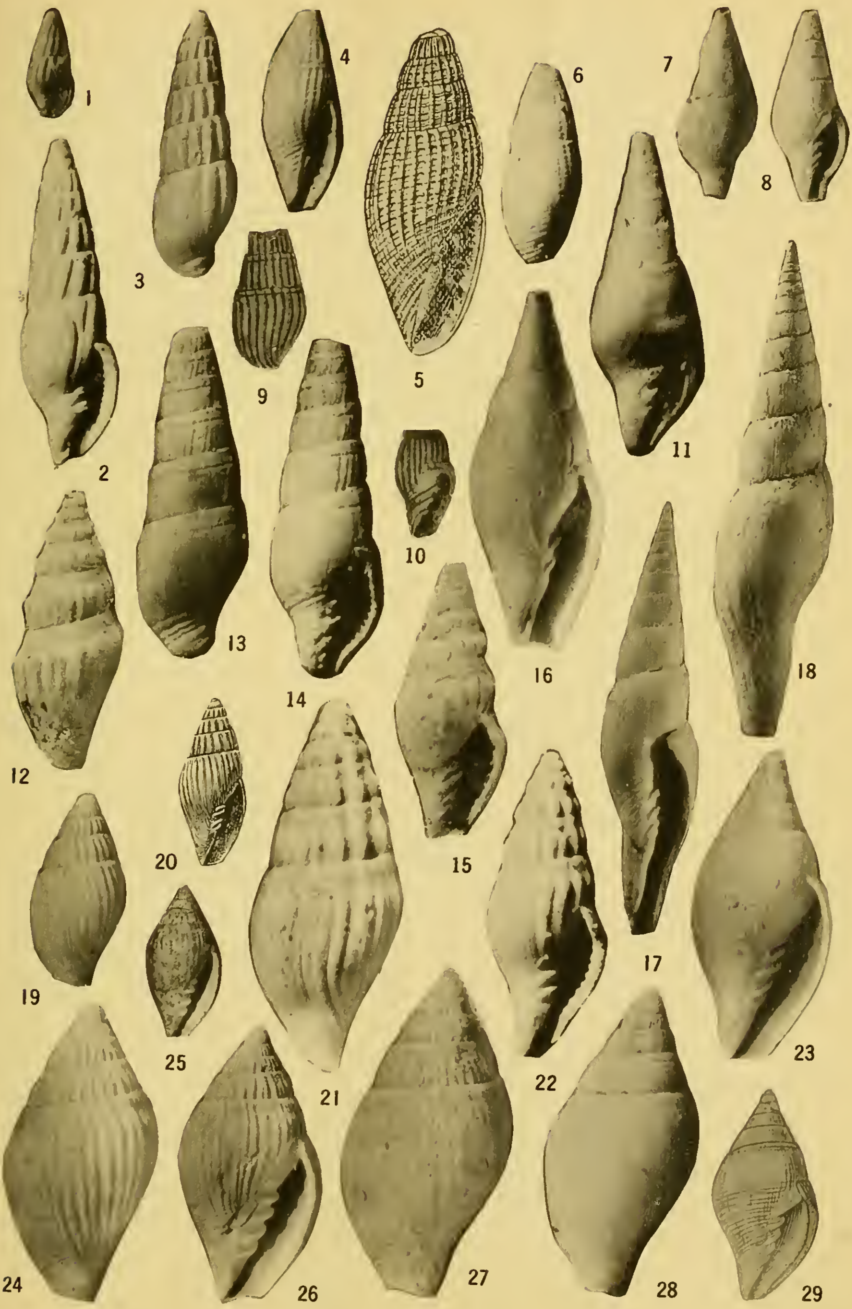

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

PLATE 67

Explanation of Plate 67

Figure		Page
1.	**Marginella columba** Lea No. 3264, P. R. I. H., 7 mm.; g. d., 5 mm. Gosport sand: Claiborne, Ala.	419
2.	**Marginella constrictoides** Meyer and Aldrich No. 3266, P. R. I. H., 9.5 mm.; g. d., 5 mm. Lower Claiborne: loc. 771	415
3.	**Marginella constricta** Conrad Copy, Conrad	416
4.	**Marginella silabra** Palmer	416

No. 3268, P. R. I. H., 10 mm.; g. d., 6.5 mm.
Gosport sand: Claiborne, Ala.

5. **Persicula (Bullata) plicata** (Lea) 426
No. 3270, P. R. I. H., 5.5 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

6. **Marginella columba** Lea 419
No. 3265, P. R. I. H., 10 mm.; g. d., 7 mm.
Gosport sand: Claiborne, Ala.

7. **Marginella constrictoides** Meyer and Aldrich 415
No. 3267, P. R. I. H., 11 mm.; g. d., 5.5 mm.
Lower Claiborne: loc. 726

8. **Persicula (Bullata) plicata** (Lea) 426
No. 3271, P. R. I. H., 5 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

9. **Marginella silabra** Palmer 416
No. 3269, P. R. I. H., 12 mm.; g. d., 8 mm.
Gosport sand: Claiborne, Ala.

10. **Persicula (Bullata) semen minima** (Lea) 425
No. 3277, P. R. I. H., 6 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

11. **Persicula (Bullata) semen exilarata** (de Gregorio) 425
No. 3272, P. R. I. H., 5 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.

12. **Marginella constrictoides** Meyer and Aldrich 415
Same specimen as fig. 7

13. **Persicula (Bullata) semen** (Lea) 422
No. 3275, P. R. I. H., 6 mm.; g. d., 4 mm.
Jackson Eocene

14. **Persicula (Bullata) semen** (Lea) 422
No. 3276, P. R. I. H., 4.5 mm.; g. d., 2.5 mm.
Jackson Eocene

15. **Marginella columba** Lea 419
Same specimen as fig. 6

16. **Persicula (Bullata) semen** (Lea) 422
No. 3279, P. R. I. H., 7 mm.; g. d., 4.5 mm.
Gosport sand: Claiborne, Ala.

17. **Persicula (Bullata) semen** (Lea) 422
No. 3274, P. R. I. H., 5 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.

18. **Persicula (Bullata) semen** (Lea) 422
No. 3273, P. R. I. H., 7 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

19. **Persicula (Bullata) semen** (Lea) 422
No. 3278, P. R. I. H., 6 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

20. **Marginella columba** Lea 419
No. 3263, P. R. I. H., 9 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

21. **Persicula (Bullata) larvata** (Conrad) 420
No. 3280, P. R. I. H., 19.5 mm.; g. d., 11 mm.
Gosport sand: Claiborne, Ala.

22. **Persicula (Bullata) larvata** (Conrad) 420
Same specimen as fig. 22

23. **Persicula (Bullata) larvata** (Conrad) 420
No. 3281, P. R. I. H., 15 mm.; g. d., 8 mm.
Lower Claiborne: loc. 726


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

PLATE 68

EXPLANATION OF PLATE 68

Figure		Page
1.	**Oliva platonica** de Gregorio Copy, De Gregorio	436
2.	**Tortoliva texana** Conrad Harris copy of Conrad	435
3.	**Ancilla staminea maternæ**, n. sp. No. 3282, P. R. I., holotype. H., 26 mm.; g. d., 9 mm. Sabine: Woods Bluff, Ala.	430
4.	**Oliva platonica** de Gregorio Copy, De Gregorio	436
5.	**Oliva platonica** de Gregorio Copy, De Gregorio	436
6.	**Oliva platonica** de Gregorio	436

Copy, De Gregorio

7. **Ancilla staminea** (Conrad) 428
No. 3284, P. R. I. H., 22 mm.; g. d., 9 mm.
Gosport sand: Claiborne, Ala.

8. **Ancilla staminea maternæ, n. sp.** 430
Same specimen as fig. 3

9. **Ancilla staminea** (Conrad) 428
No. 3285, P. R. I. H., 26.5 mm.; g. d., 9 mm.
Gosport sand: Claiborne, Ala.

10. **Ancilla staminea punctulifera** (Gabb) 429
No. 3283, P. R. I. H., 22 mm.; g. d., 8 mm.
Lower Claiborne: loc. 733

11. **Ancilla staminea** (Conrad) 428
Same specimen as fig. 7

12. **Agaronia bombylis** (Conrad) 434
No. 3286, P. R. I. H., 21.5 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.

13. **Agaronia bombylis** (Conrad) 434
No. 3287, P. R. I. H., 21 mm.; g. d., 6.5 mm.
Gosport sand: Claiborne, Ala.

14. **Agaronia alabamensis** (Conrad) 431
No. 3288, P. R. I. H., 30 mm.; g. d., 12 mm.
Photographed to show coloring
Gosport sand: Claiborne, Ala.

15. **Agaronia alabamensis** (Conrad) 431
Same specimen as fig. 14. Surface coated

16. **Agaronia alabamensis** (Conrad) 431
No. 3289, P. R. I. H., 12 mm.; g. d., 5 mm.
Sutural collar eroded
Gosport sand: Claiborne, Ala.

17. **Ancilla staminea punctulifera** (Gabb) 429
Same specimen as fig. 10

18. **Agaronia alabamensis** (Conrad) 431
No. 3290, P. R. I. H., 45 mm.; g. d., 17 mm.
Gosport sand: Claiborne, Ala.

19. **Agaronia alabamensis** (Conrad) 431
No. 3291, P. R. I. H., 42 mm.; g. d., 17 mm.
Gosport sand: Claiborne, Ala.

20. **Agaronia alabamensis** (Conrad) 431
Same specimen as fig. 19
Turned to show contour of lines on anterior callus

21. **Agaronia alabamensis** (Conrad) 431
No. 3292, P. R. I. H., 31 mm.; g. d., 12 mm.
Gosport sand: Claiborne, Ala.

22. **Agaronia alabamensis** (Conrad) 431
No. 3293, P. R. I. H., 27 mm.; g. d., 10 mm.
Lower Claiborne: loc. 103

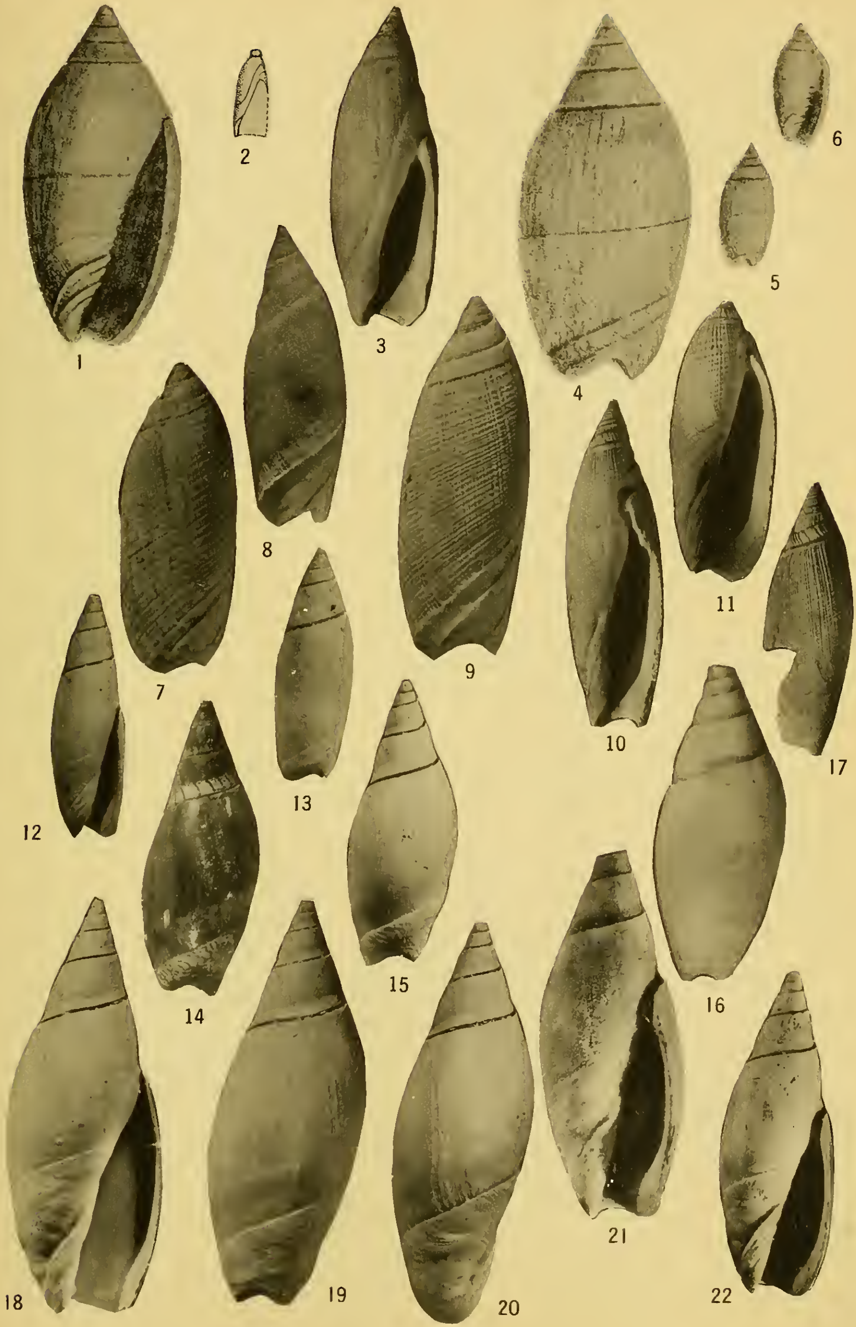

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

PLATE 69

EXPLANATION OF PLATE 69

Figure		Page
1.	**Bonellitia garvani**, n. sp. No. 3294, P. R. I., syntype. H., 12 mm.; g. d., 8 mm. Lower Claiborne: loc. 731	452
2.	**Bonellitia garvani**, n. sp. Same specimen as fig. 2	452
3.	**Bonellitia garvani**, n. sp. No. 3295, P. R. I., syntype. H., 7 mm.; g. d., 5 mm. Lower Claiborne, loc. 729	452
4.	**Bonellitia tortiplica** (Conrad) McConnell drawing, Harris, 1896. H., 8.5 mm. Lower Claiborne: Cedar Creek, southeast corner of Wheelock league, Robertson Co., Texas	451
5.	**Bonellitia tortiplica** (Conrad) Copy, Conrad, 1865	451
6.	**Trigonostoma panones** (Harris)	442

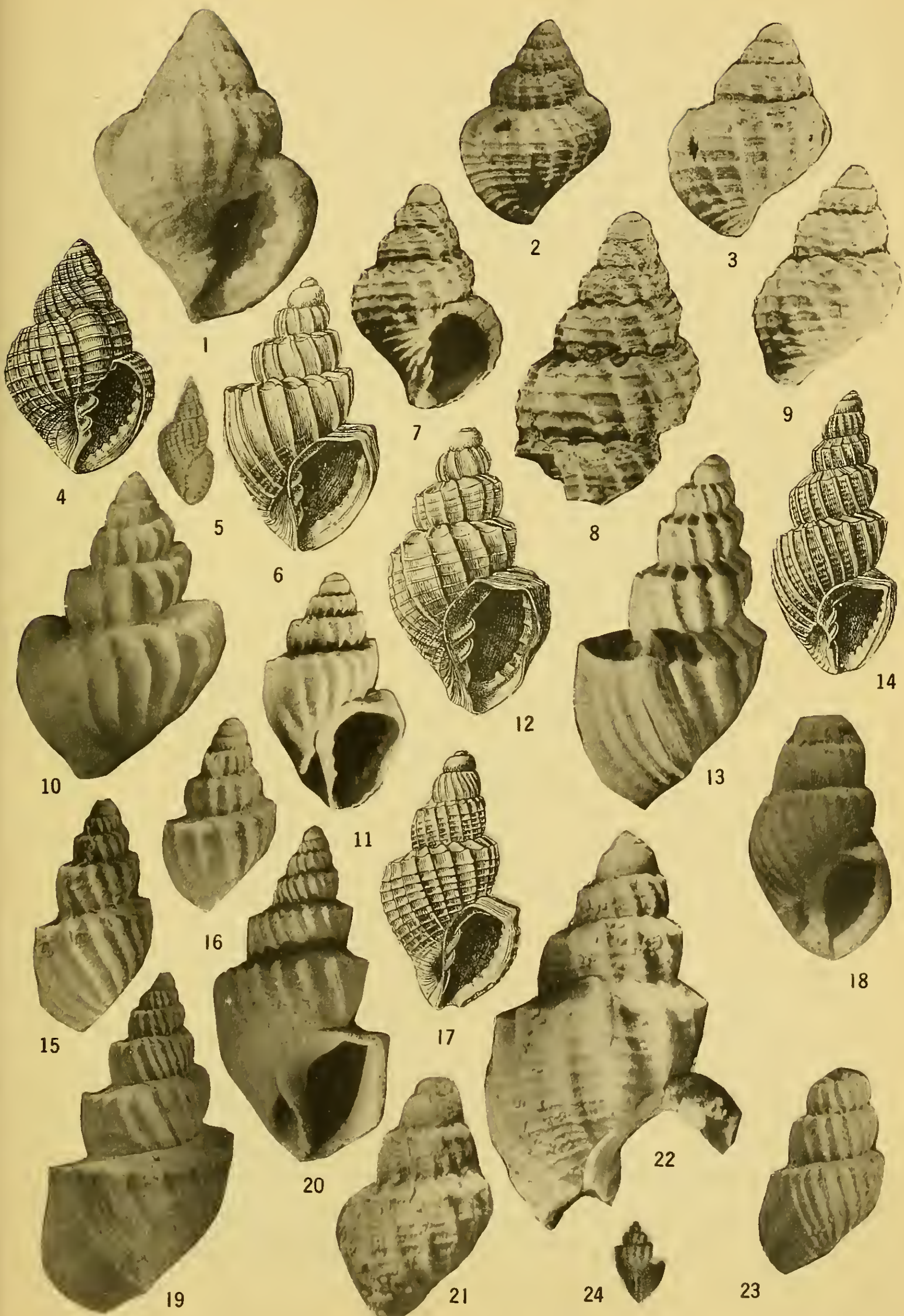

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

PLATE 70

Explanation of Plate 70

Figure		Page
1.	**Bonellitia ulmula** (Harris) No. 3307, P. R. I. H., 10.5 mm.; g. d., 6 mm. Lower Claiborne: loc. 723	455
2.	**Trigonostoma pulcherrimum** (H. C. Lea) **Cancellaria dictyella** Cossmann, type Drawn by Chavan. H., 7 mm.	440
3.	**Trigonostoma harrisi**, n. sp. No. 3308, P. R. I., holotype. H., 9 mm.; g. d., 5 mm. Lower Claiborne: loc. 733	444
4.	**Trigonostoma pulcherrimum chavani**, n. var. No. 3309, P. R. I., syntype. H., 11 mm.; g. d., 5 mm. Lower Claiborne: loc. 707	442
5.	**Cancellaria sotoensis** Aldrich Holotype, Johns Hopkins Univ.	457
6.	**Trigonostoma harrisi**, n. sp. Same specimen as fig. 3	444
7.	**Bonellitia ulmula** (Harris) Same specimen as fig. 1	455
8.	**Bonellitia ulmula** (Harris) McConnell drawing, holotype. H., 7.5 mm. Lower Claiborne: On Elm Creek, from Orrell's to Price's crossing, Lee Co., Texas	455
9.	**Trigonostoma pulcherrimum** (H. C. Lea) **Cancellaria dictyella** Cossmann type. Chavan drawing. H., 11 mm.	440
10.	**Trigonostoma pulcherrimum chavani**, n. sp. No. 3310, P. R. I., syntype. H., 13 mm.; g. d., 5 mm. Lower Claiborne: loc. 707	442

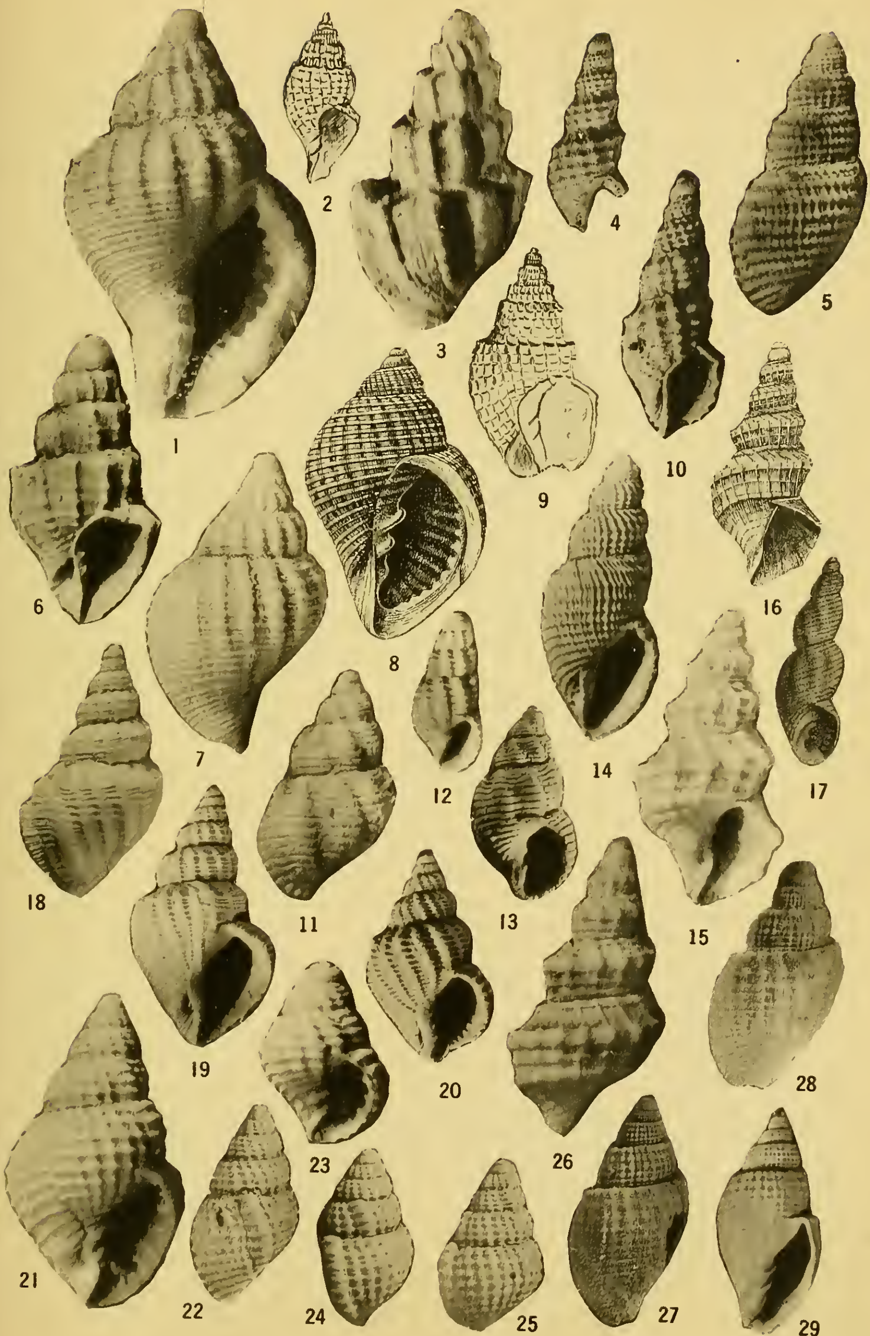

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

PLATE 71

EXPLANATION OF PLATE 71

Figure — Page

1. **Conus sauridens** Conrad 458
   No. 3323, P. R. I. g. d., 23 mm.
   Gosport sand: Claiborne, Ala.
2. **Conus sauridens** Conrad 458
   No. 3324, P. R. I. H., 17 mm.; g. d., 12 mm. Young
   Lower Claiborne: loc. 731
3. **Conus sauridens** Conrad 458
   No. 3325, P. R. I. H., 22 mm.; g .d., 11 mm.
   Lower Claiborne: loc. 723
4. **Conus sauridens** Conrad 458
   No. 3326, P. R. I. H., 29 mm.; g. d., 17 mm.
   Lower Claiborne: loc. 725
5. **Conus sauridens** Conrad 458
   No. 3327, P. R. I. g. d., 20 mm.
   Lower Claiborne: loc. 734
6. **Conus sauridens** Conrad 458
   No. 3338, P. R. I., g. d., 20 mm.
   Conus alveatus Conrad. Vicksburg Oligocene: Vicksburg, Miss.
7. **Conus sauridens** Conrad 458
   No. 3329, P. R. I. H., 30 mm.; g. d., 15 mm.
   Conus alveatus Conrad
   Vicksburg Oligocene: Vicksburg, Miss.
8. **Conus sauridens** Conrad 458
   No. 3330, P. R. I. g. d., 52 mm.
   Conus tortilis Conrad
   Jackson Eocene
9. **Conus sauridens** Conrad 458
   No. 3331, P. R. I. H., 8 mm.; g. d., 4 mm. Young
   Claibornian: loc. 136
10. **Conus sauridens** Conrad 458
    No. 3332, P. R. I. H., 48 mm.; g. d., 25 mm.
    Claibornian: loc. 136
11. **Conus sauridens** Conrad 458
    No. 3334, P. R. I. H., 74 mm.; g. d., 42 mm.
    Gosport sand: Claiborne, Ala.
12. **Conus sauridens** Conrad 458
    No. 3335, P. R. I. H., 67 mm.; g. d., 35 mm.
    Conus tortilis Conrad
    Jackson Eocene
13. **Conus sauridens** Conrad 458
    No. 3333, P. R. I. H., 8 mm.; g. d., 4 mm. Young
    Claibornian: loc. 136
14. **Conus sauridens** Conrad 458
    Same specimen as fig. 8


1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 72

EXPLANATION OF PLATE 72

Figure		Page
1.	**Terebra ziga** de Gregoroio Copy, De Gregorio	465
2.	**"Hastula" venusta** (Lea) var. No. 3336, P. R. I. H., 22.5 mm.; g. d., 5 mm. Claibornian: loc. 136	470

3. **Hastula sabina**, n. sp. 473
No. 3337, P. R. I., paratype. H., 18 mm.; g. d., 6 mm.
Lower Claiborne: loc. 725
4. **Hastula sabina**, n. sp. 470 3
No. 3338, P. R. I. holotype, H., 25 mm.; g. d., 5 mm.
Lower Claiborne: loc. 725
5. **"Hastula" venusta** (Lea) 470
No. 3339, P. R. I. H., 17 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.
6. **Hastula sabina**, n. sp. 473
Same specimen as fig. 4
7. **Terebra ziga** de Gregorio 465
Copy, de Gregorio
8. **Terebra (Terebrella) mirula** de Gregorio 467
No. 3341, P. R. I. H., 10 mm.; g. d., 2 mm. Young
Lower Claiborne: Little Brazos River, Texas
9. **"Hastula" venusta** (Lea) var. 470
Same specimen as fig. 2
10. **Terebra (Terebrella) mirula** de Gregorio 467
No. 3340, P. R. I. H., 11 mm.; g. d., 3 mm.
Lower Claiborne: loc. 741
11. **Terebra (Terebrella) mirula** de Gregorio 467
Same specimen as fig. 8
12. **Hastula houstonia** (Harris) 471
No. 3342, P. R. I. H., 14 mm.; g. d., 4 mm.
Lower Claiborne: loc. 741
13. **Hastula houstonia** (Harris) 471
No. 3343, P. R. I. H., 15 mm.; g. d., 15 mm.
Lower Claiborne: loc. 741
14. **Hastula houstonia** (Harris) 471
No. 3344, P. R. I. H., 17 mm.; g. d., 2 mm. Young
Lower Claiborne: loc. 741
15. **Terebra (Terebrella) polygyra** (Conrad) 469
Holotype, A. N. S.
16. **Terebra (Terebrella) mirula** de Gregorio 467
Holotype, **T. texagyra** Harris. H., 22 mm.
Lower Claiborne: South fork of Hurricane Creek, two miles west of Crockett, Houston Co., Texas
17. **Terebra (Terebrella) mirula** de Gregorio 467
No. 3345, P. R. I. H., 22 mm.; g. d., 5 mm.
Typical **T. texagyra** Harris
Lower Claiborne: Hurricane Bayou, near crossing of Rusk road, Houston Co., Texas
18. **Terebra (Terebrella) mirula** de Gregorio 467
No. 3346, P. R. I. H., 21 mm.; g. d., 6 mm.
Typical **T. texagyra** Harris
Lower Claiborne: South fork of Hurricane Creek, two miles west of Crockett, Houston Co., Texas
19. **Terebra (Terebrella) mirula** de Gregorio 467
Copy, De Gregorio
20. **Terebra (Terebrella) mirula** de Gregorio 467
Copy, De Gregorio
21. **Terebra (Terebrella) mirula** de Gregorio 467
Copy, De Gregorio

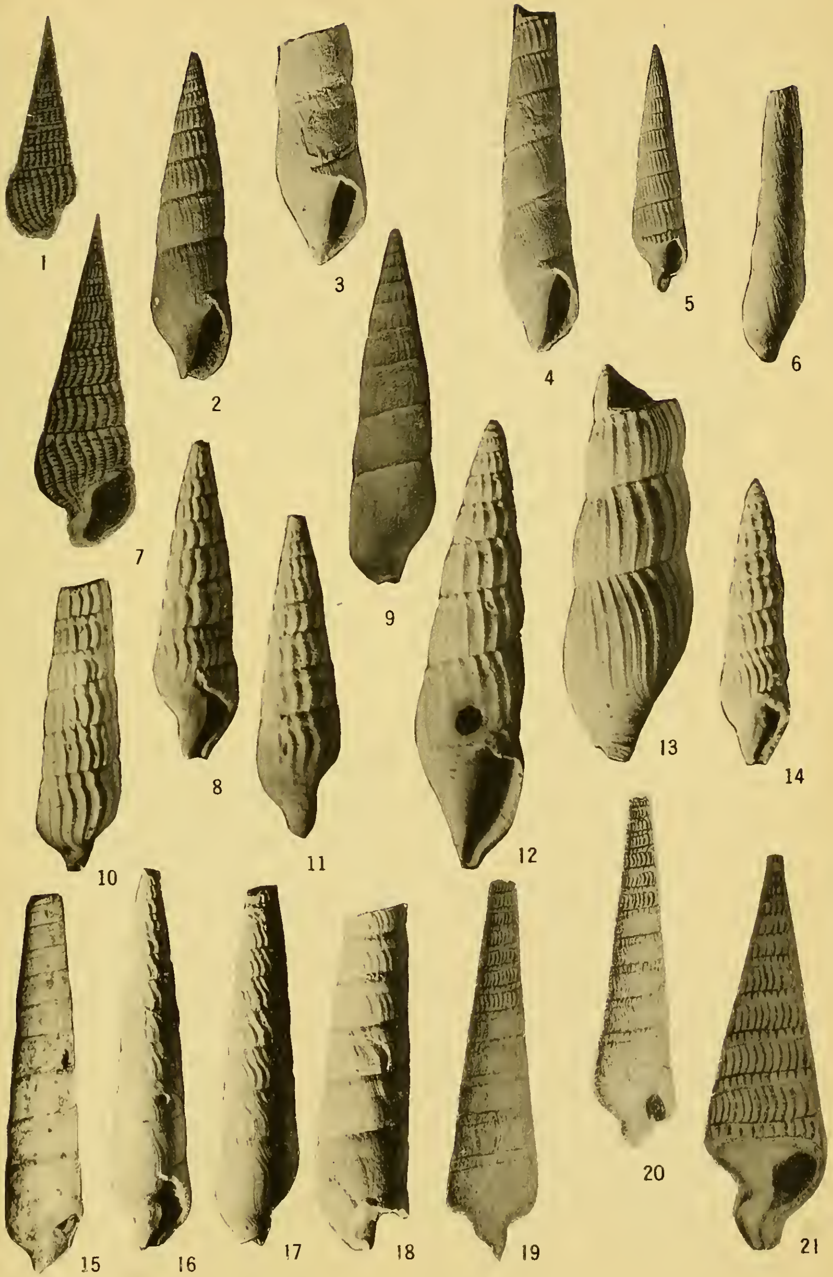

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

PLATE 73

Explanation of Plate 73

Figure		Page
1.	**Ringicula claibornensis** Aldrich Original drawing, holotype. H., 3 mm.	478
2.	**Ringicula biplicata** (Lea) Drawing, Aldrich, 1897. H., 3 mm.	475
3.	**Ringicula lisbonensis** Aldrich Original drawing, holotype. H., 2.5 mm.	478
4.	**Ringicula claibornensis** Aldrich Specimen Alabama Museum of Natural History Gosport sand: Claiborne, Ala.	478
5.	**Ringicula claibornensis** Aldrich Specimen Ala. Mus. Nat. Hist. Gosport sand: Claiborne, Ala.	478
6.	**Ringicula biplicata** (Lea) Specimen Ala. Mus. Nat. Hist. Gosport sand: Claiborne, Ala.	478
7.	**Ringicula trapaquara deusseni** Gardner No. 3356, P. R. I. H., 3 mm.; g. d., 1.55 mm. Lower Claiborne: loc. 741	477
8.	**Ringicula trapaquara** Harris McConnell drawing, holotype. H., 2 mm. Lower Claiborne: Little Brazos River, near iron bridge on Moseley's Ferry road, Texas	476

9. **Ringicula biplicata** (Lea) 475
Coll., H. E. Wheeler
Gosport sand: Claiborne, Ala.

10. **Ringicula trapaquara deusseni** Gardner 477
No. 3357, P. R. I. H., 1.45 mm.; g. d., .95 mm. Young
Lower Claiborne: loc. 741

11. **Ringicula trapaquara deusseni** Gardner 477
No. 3358, P. R. I. H., 2.5 mm.; g. d., 1.40 mm.
Lower Claiborne: loc 725

12. **Ringicula biplicata** (Lea) 475
Coll., H. E. Wheeler, No. 6152
Gosport sand: Claiborne, Ala.

13. **Ringicula trapaquara deusseni** Gardner 477
No. 3359, P. R. I. H., 3 mm.; g. d., 1.60 mm.
Lower Claiborne: loc. 741

14. **Trigonostoma auroræ, n. sp.** 445
No. 3350, P. R. I. (broken)
Gosport sand: Claiborne, Ala.

15. **Trigonostoma auroræ, n. sp.** 445
No. 3351, P. R. I., holotype. H., 6.5 mm.; g. d., 4 mm.
Claibornian: loc. 136

16. **Trigonostoma auroræ, n. sp.** 445
Same specimen as fig. 15

17. **Conus (Lithoconus) smithvillensis** Harris 464
No. 3348, P. R. I. H., 27 mm.; g. d., 11 mm.
Lower Claiborne: loc. 733

18. **Conus (Lithoconus) protractus** Meyer 463
Copy, Meyer

19. **Conus granopsis** de Gregorio 464
Copy, De Gregorio

20. **Conus granopsis** de Gregorio 464
Copy, De Gregorio

21. **Conus (Lithoconus) smithvillensis** Harris 464
Same specimen as fig. 17

22. **Trigonostoma babylonicum** (Lea) 437
No. 3353, P. R. I. H., 9 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.

23. **Bonellitia bastropensis** (Harris) 453
McConnell drawing, holotype. H., 12 mm.
Lower Claiborne: Smithville, Bastrop Co., Texas.

24. **Trigonostoma babylonicum** (Lea) 437
No. 3354, P. R. I. H., 7 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

25. **Trigonostoma babylonicum** (Lea) 437
No. 3352, P. R. I. H., 6 mm.; g. d., 4 mm.
Lower Claibornian: loc. 708

26. **Trigonostoma babylonicum** (Lea) 437
No. 3355, P. R. I. H., 4 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.

27. **Bonellitia bastropensis** (Harris) 453
No. 3349, P. R. I. H., 12 mm.; g. d., 6 mm.
Lower Claiborne: loc. 733

28. **Bonellitia bastropensis** (Harris) 453
Same specimen as fig. 27


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

PLATE 74

Explanation of Plate 74

Figure		Page
1.	**Ovulactæon aldrichi** Wheeler Holotype, coll. H. E. Wheeler, No. 6245	503
2.	**Ovulactæon aldrichi** Wheeler Copy, Wheeler	503
3.	**Volvulella loisæ,** n. sp. No. 3367, P. R. I., holotype. H., 4 mm.; g. d., 1.45 mm. Lower Claiborne: loc. 723	495
4.	**Volvulella loisæ,** n. sp. Same specimen as fig. 3	495
5.	**Volvulella wellsi,** n. sp. No. 3360, P. R. I., holotype. H., 3.5 mm.; g. d., 1.40 mm. Lower Claiborne: loc. 741	494
6.	**Volvulella wellsi,** n. sp. No. 3361, P. R. I., paratype. H., 3 mm.; g. d., 1.3 mm. Lower Claiborne: loc. 741	494
7.	**Volvulella subradius** (Meyer) Copy, Meyer	492
8.	**Volvulella smithvillensis** (Harris) McConnell drawing, holotype. H., 3 mm. Lower Claiborne: Smithville, Bastrop Co., Texas	494
9.	**Volvulella minutissima** (Gabb) No. 3368, P. R. I. H., 2 mm.± (broken) Lower Claiborne: loc. 741	493
10.	**Volvulella minutissima** (Gabb) No. 3362, P. R. I. H., 1.75 mm.; g. d., .95 mm. Lower Claiborne: loc. 741	493
11.	**Volvulella minutissima** (Gabb) Same specimen as fig. 10	493
12.	**Volvulella minutissima** (Gabb) Copy, Gabb	493
13.	**Volvulella volutata** (Meyer and Aldrich) No. 3363, P. R. I. H., 6.5 mm.; g. d., 2.5 mm. Lower Claiborne: loc. 734	492
14.	**Volvulella volutata** (Meyer and Aldrich) Same specimen as fig. 13	492
15.	**Volvulella Conradiana** (Gabb) No. 3364, P. R. I. H., 4 mm.; g. d., 1.5 mm. Lower Claiborne: loc. 734	494
16.	**Volvulella Conradiana** (Gabb) No. 3365, P. R. I. H., 5 mm.; g. d., 1.5 mm. Lower Claiborne: loc. 734	494
17.	**Volvulella Conradiana** (Gabb) No. 3366, P. R. I. H., 5.5 mm.; g. d., 1.5 mm. Lower Claiborne: loc. 734	494
18.	**Volvulella Conradiana** (Gabb)	494

Same specimen as fig. 16

19. **Acteon idoneus** Conrad 500
No. 3369, P. R. I. H., 7 mm.; g. d., 5 mm.
Gosport sand: loc. 104

20. **Acteon idoneus** Conrad 500
No. 3372, P. R. I. H., 3+ mm.; g. d., 2.5 mm.
Lower Claiborne: loc. 741

21. **Acteon idoneus** Conrad 500
No. 3370, P. R. I. H., 21 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.

22. **Acteon idoneus** Conrad 500
No. 3371, P. R. I. H., 10 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

23. **Nucleopsis subvaricatus** (Conrad) 502
No. 3373, P. R. I. H., 11 mm.; g. d., 6.5 mm.
Gosport sand: Claiborne, Ala.

24. **Nucleopsis subvaricatus** (Conrad) 502
No. 3374, P. R. I. H., 10 mm.; g. d., 6 mm.
Gosport sand: Claiborne, Ala.

25. **Acteon pomilius punctatus** Lea 499
No. 3375, P. R. I. H., 8.5 mm.; g. d., 4.5 mm.
Gosport sand: Claiborne, Ala.

26. **Nucleopsis subvaricatus** (Conrad) 502
Same specimen as fig. 24

27. **Acteon pomilius** Conrad 496
No. 3380, P. R. I. H., 9 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

28. **Acteon pomilius** Conrad 496
No. 3381, P. R. I. H., 10 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

29. **Acteon pomilius punctatus** Lea 499
No. 3377, P. R. I. H., 5 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.

30. **Acteon annectens** Meyer 498
No. 3386, P. R. I. H., 6.5 mm.; g. d., 3.5 mm.
Jackson: Moody's Branch, Jackson, Miss.

31. **Acteon pomilius punctatus** Lea 499
No. 3376, P. R. I. H., 7 mm.; g. d., 4 mm.
Lower Claiborne: loc. 723

32. **Acteon clabornincola** de Gregorio 501
Copy, De Gregorio

33. **Acteon clabornincola** de Gregorio 501
Copy De Gregorio

34. **Acteon pomilius** Conrad 496
No. 3382, P. R. I. H., 9 mm.; g. d., 5 mm.
Gosport sand: Claiborne, Ala.

35. **Acteon pomilius punctatus** Lea 499
No. 3378, P. R. I. H., 6 mm.; g. d., 3 mm.
Gosport sand: Claiborne, Ala.

36. **Acteon pomilius punctatus** Lea 499
No. 3379, P. R. I. H., 8 mm.; g. d., 4 mm.
Gosport sand: Claiborne, Ala.

37. **Acteon**, sp. 499
A. punctatus Dall non Lea
No. 97464, U. S. Nat. Mus. X10
Caloosahatchie Pliocene: Florida


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37

PLATE 75

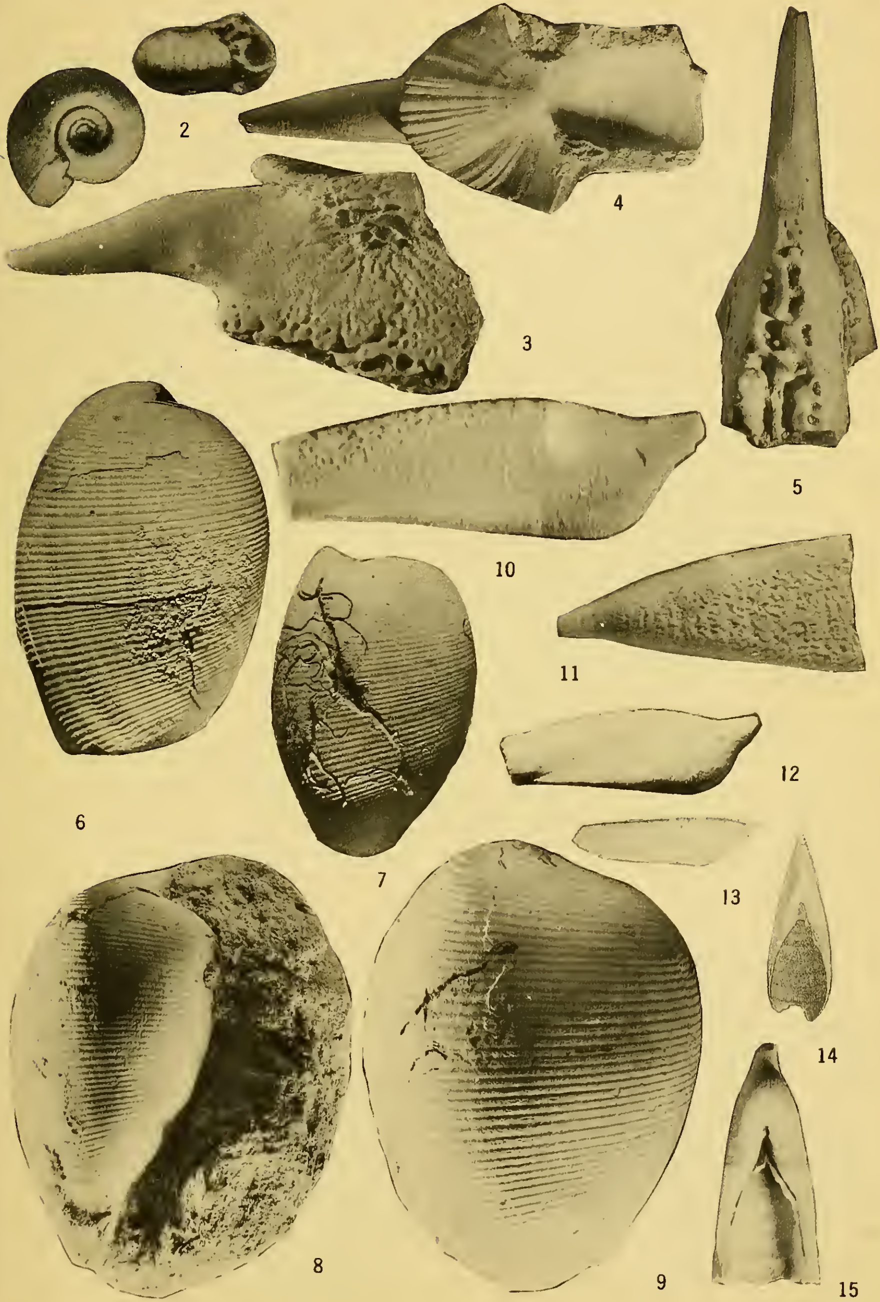
Explanation of Plate 75

Figure		Page
1.	**Acteocina commixta** (de Gregorio) Copy, De Gregorio	490
2.	? **Acteocina commixta** (de Gregorio) Harris drawing, No. 2391, U. S. Nat. Mus. Gosport sand: Claiborne, Ala.	490
3.	**Acteocina commixta** (de Gregorio) Copy, De Gregorio	490
4.	**Atlanta eocenica**, n. sp. No. 3383, P. R. I., holotype. H., 2 mm.; g. d., 8 mm. Lower Claiborne: loc. 723	474
5.	**Atlanta eocenica**, n. sp. Same specimen as fig. 4	474
6.	**Atlanta eocenica**, n. sp. Same specimen as fig. 5	474
7.	**Aderospira stewarti**, n. sp. No. 3384, P. R. I., holotype. H., 3 mm.; g. d., 1.5 mm.	488
8.	**Abderospira stewarti**, n. sp. Same specimen as fig. 7	488
9.	**Abderospira meyeri** Palmer **Bulla biumbilicata** Meyer non Deshayes Copy, Meyer	487
10.	**Abderospira Aldrichi** (Langdon) No. 3385, P. R. I. H., 5 mm.; g. d., 3 mm. Lower Claiborne: loc. 726	485
11.	**Abderospira Aldrichi** (Langdon) Same specimen as fig. 10	485
12.	**Abderospira sabina**, n. sp. **Cylichna aldrichi** Aldrich. Original drawing, holotype.	487
13.	**Cylichnina Kellogii** (Gabb) No. 3387, P. R. I. H., 8 mm.; g. d., 3 mm. Lower Claiborne: loc. 723	481
14.	**"Atys" salina** (Dall) No. 106971, U. S. Nat. Mus., syntype	488
15.	**"Atys" salina** (Dall) **Syntype**	488


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34

PLATE 76

EXPLANATION OF PLATE 76



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

PLATE 77

Explanation of Plate 77

Figure		Page
1.	**Belosæpia alabamensis, n. sp.**	508
	No. 3403, P. R. I. L., 23 mm.; w., 16 mm.	
	Lower Claiborne: loc. 103	
2.	**Belosæpia ungula** Gabb	505
	Copy, Gabb	
3.	**Belosæpia ungula** Gabb	505
	Copy, Gabb	

4. **Belosæpia saccaria,** n. sp. 509
No. 3404, P. R. I., holotype. L., 22 mm.; w., 6 mm. (broken); h., 20 mm.
Lower Claiborne: loc. 778

5. **Belosæpia ungula** Gabb 505
No. 3405, P. R. I. L., 26 mm.; w., 18 mm.; h., 18 mm.
Lower Claiborne: loc. 733

6. **Belosæpia ungula** Gabb 505
Same specimen as fig. 5

7. **Belosæpia ungula** Gabb 505
Copy, Gabb

8. **Belosæpia uncinata,** n. sp. 507
No. 3406, P. R. I., paratype. L., 29 mm.; w., 11 mm. (broken); h., 17 mm.
Lower Claiborne: loc. 724

9. **Belosæpia uncinata,** n. sp. 507
No. 3407, P. R. I., holotype. L., 25 mm.; w., 18 mm.; h., 15 mm.
Lower Claiborne: loc. 724

10. **Belosæpia alabamensis voltzi,** n. var. 509
No. 3408, P. R. I., holotype. L., 32 mm.; w., 13 mm.; h., 19 mm.
Lower Claiborne: loc. 103

11. **Belosæpia harrisi,** n. sp. 510
No. 3409, P. R. I., holotype. L., 25 mm.; w., 14 mm.; h., 18 mm.
Lower Claiborne: loc. 103

12. **Belosæpia alabamensis voltzi,** n. sp. 509
Same specimen as fig. 10

13. **Belosæpia saccaria,** n. sp. 509
Same specimen as figs. 4, 16

14. **Belosæpia ungula** Gabb 505
Same specimen as figs. 5, 6

15. **Belosæpia alabamensis,** n. sp. 508
Same specimen as fig. 1

16. **Belosæpia saccaria,** n. sp. 509
Same specimen as figs. 4, 13

17. **Belosæpia harrisi,** n. sp. 510
Same specimen as fig. 11

18. **Belosæpia uncinata,** n. sp. 507
Same specimen as fig. 8

19. **Belosæpia harrisi,** n. sp. 510
Same specimen as fig. 17

20. **Belosæpia uncinata,** n. sp. 507
Same specimen as fig. 9

21. **Belosæpia uncinata,** n. sp. 507
No. 3410, P. R. I., paratype. L., 25 mm.; w., 17 mm.; h., 19 mm.
Lower Claiborne: loc. 724

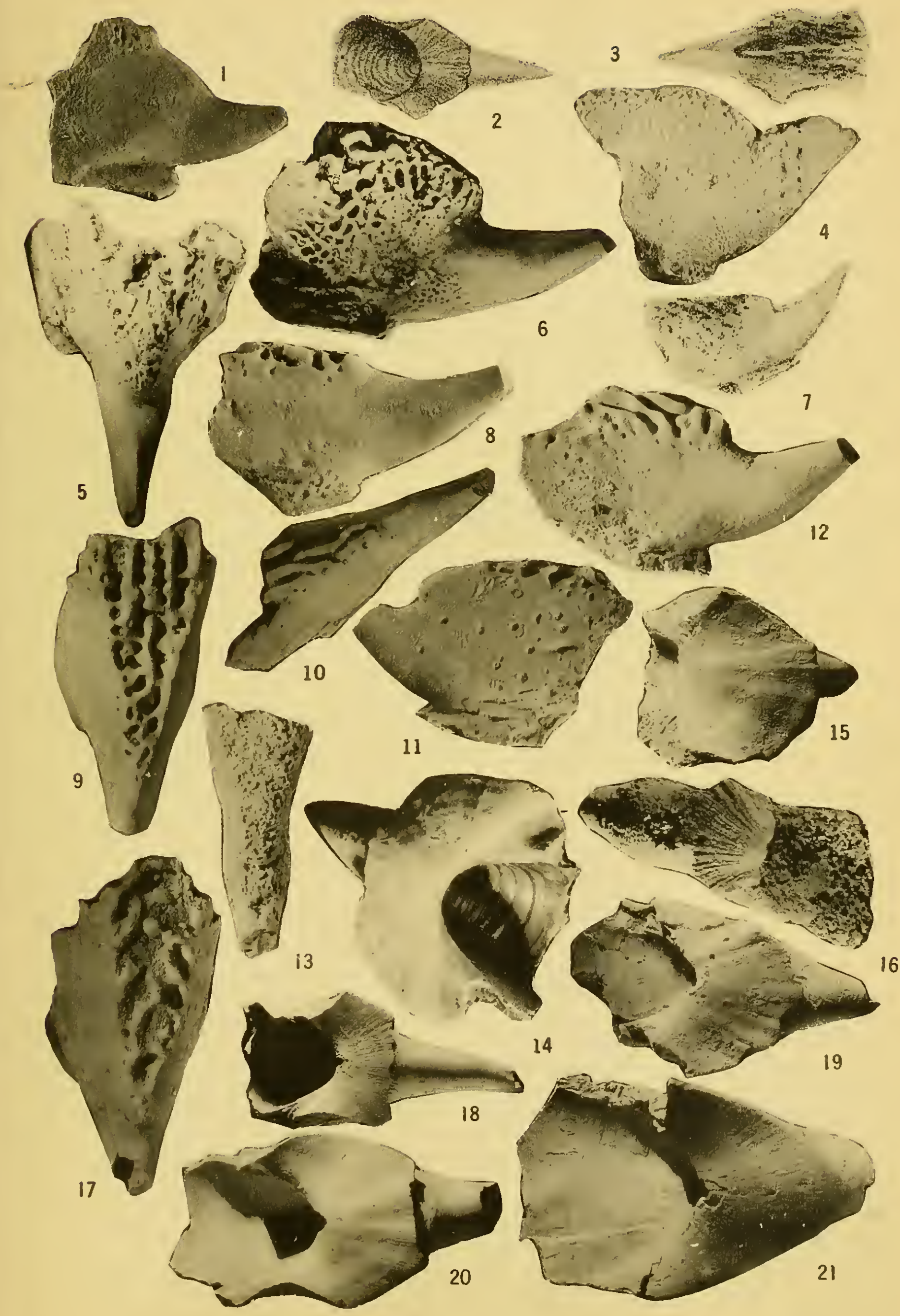

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

PLATE 78

EXPLANATION OF PLATE 78

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. Unless otherwise noted all came from the Gosport sand, Claiborne, Ala.

Figure		Page
1.	**Cadulus (Dischides) subcoarcuatus** (Gabb) Lower Claiborne: Wheelock, Texas	24
2.	**Cadulus (Polyschides) turritus** (Lea)	22
2.	**cf. Norrisia (Norrisella) parva** (H. C. Lea)	43
4.	**? Solariorbus planulatus** (H. C. Lea)	49
5.	**Solarium elegans** Lea Under **Solariella stalagmium** (Conrad)	33
6.	**Solarium elegans** Lea Under **Solariella stalagmium** (Conrad)	33
7.	**Solarium granulatum** Lea Under **Solariella tricostata** (Conrad)	37
8.	**Pasithea minima** H. C. Lea Under **Melanella aciculata** (Lea)	63
9.	**Solarium elegans** Lea Under **Solariella stalagmium** (Conrad)	33
10.	**Delphinula solaroides** Heilprin Under **Solariella stalagmium** Conrad H., 2.5 mm.	33
11.	**Delphinula solaroides** Heilprin Another view of fig. 10	33
12.	**Cirsochilus (Claibornia) lineatus** (Lea) H., 2.5 mm.	58
13.	**Solariella cancellata** (Conrad)	36
14.	**Solariorbis depressus** (Lea)	50
15.	**Solariorbis rotulus** (Heilprin)	49
16.	**Solariorbis rotulus** (Heilprin) Dorsal view of fig. 15	49
17.	**Cirsochilus (Claibornia) lineatus** (Lea) Ventral view of fig. 18	58
18.	**Cirsochilus (Claibornia) lineatus** (Lea)	58
19.	**Pasitheola claibornensis** (Lea)	69
20.	**Melanella tenua** (Gabb) Lower Claiborne: "Caldwell Co., Texas"	64
21.	**Melanella exilis** (Gabb) Lower Claiborne: Caldwell, Texas (Gabb)	64

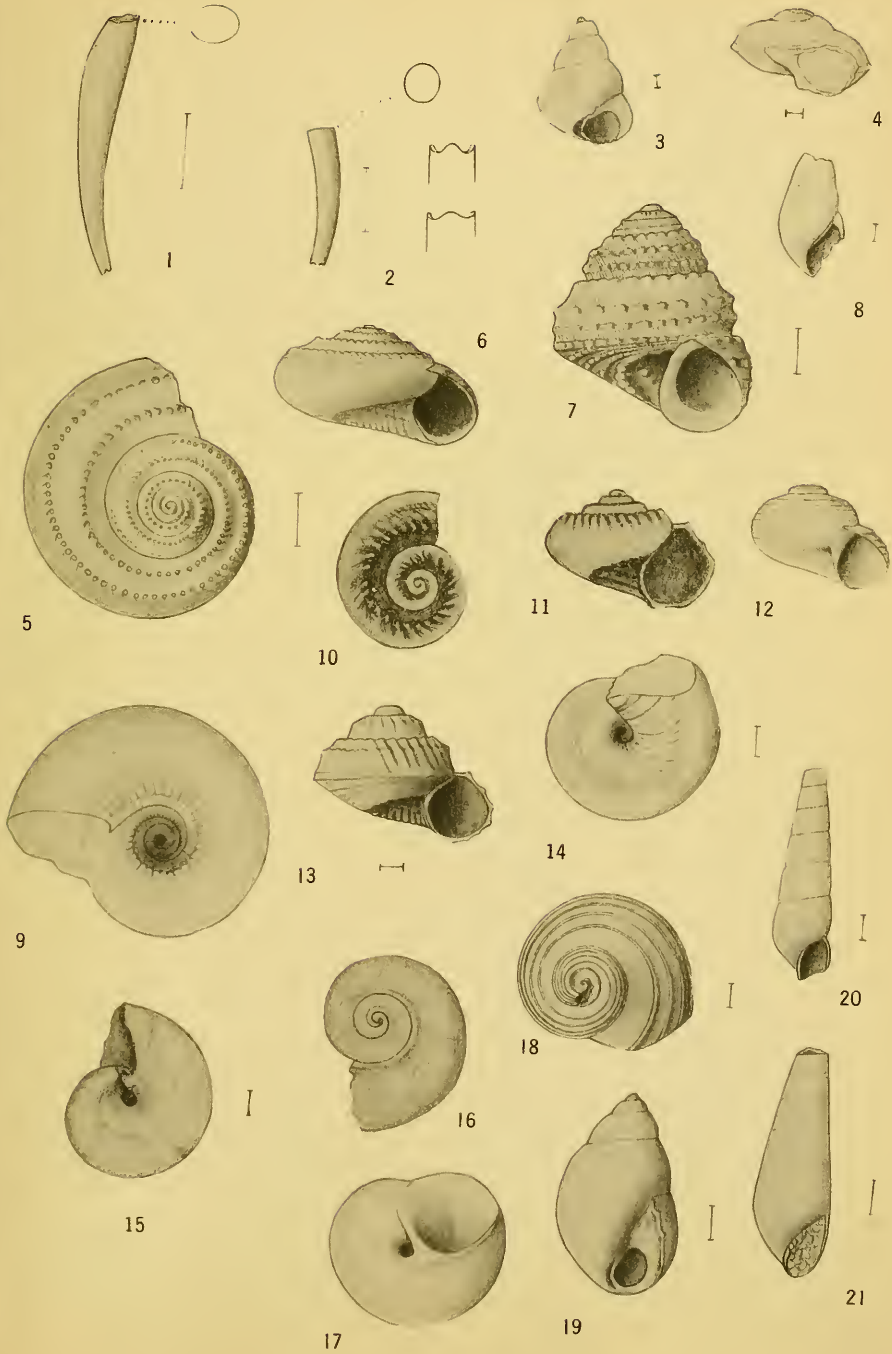

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

PLATE 79

EXPLANATION OF PLATE 79

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All came from the Gosport sand, Claiborne, Ala.

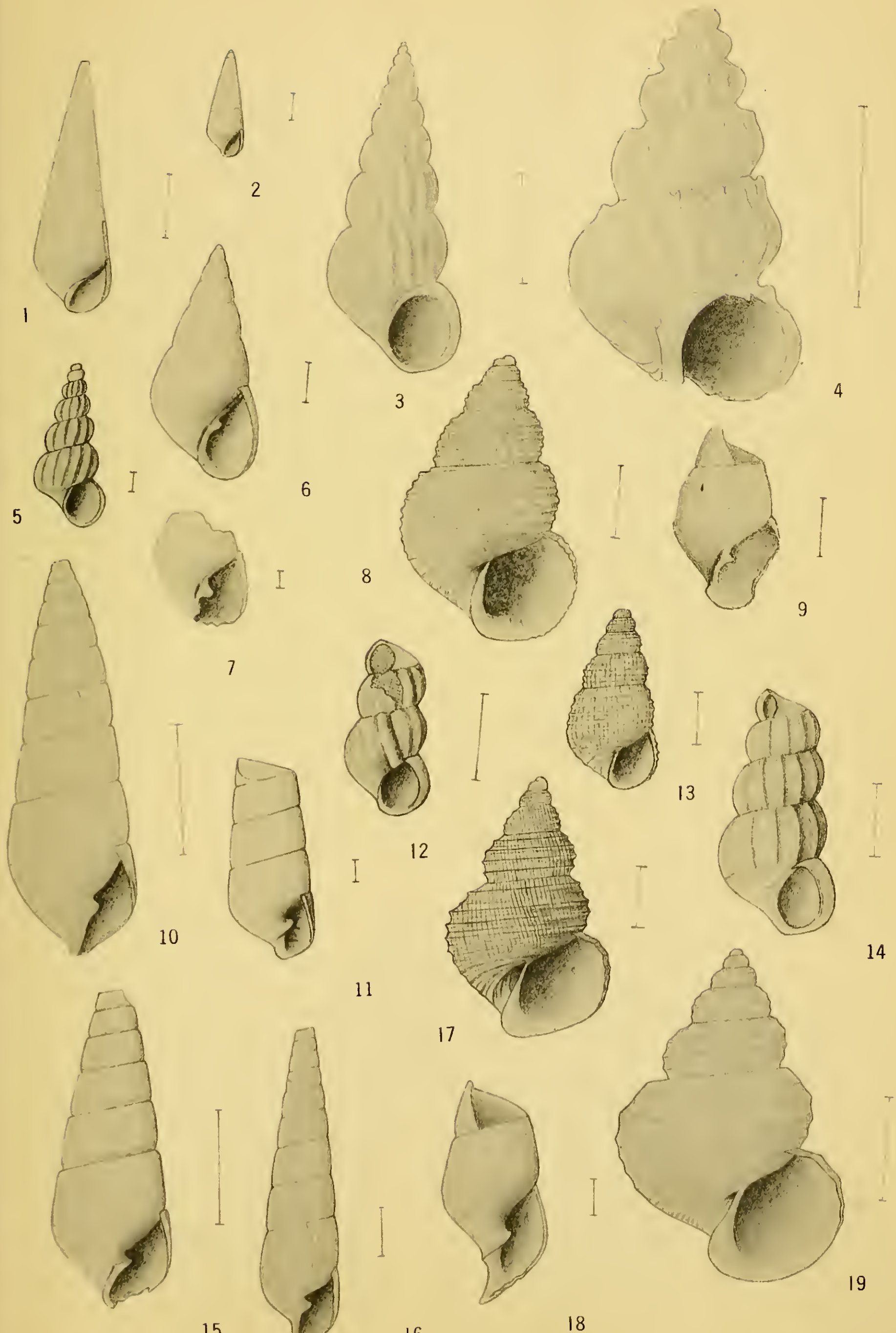

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

PLATE 80

EXPLANATION OF PLATE 80

Type figures drawn by Otto Meyer. Specimens in the A. N. S., Philadelphia, Pa. All came from the Gosport sand, Claiborne, Ala. unless otherwise noted.

Figure		Page
1.	**Natica minor** Lea	115
	Under "**Natica**" "(**Naticarus**)" **semilunata** Lea	
2.	**Natica bisulcata** Heilprin	113
	Under **Natica (Naticarius) magno-umbilicata** Lea	
3.	**Natica (Naticarius) magno-umbilicata** Lea	113
4.	**Crommium perovatum** (Conrad)	136
5.	? **Scalaria quinquefasciata** Lea	97
	Under **Cirsotrema (Coroniscala) nassula** (Conrad)	
6.	"**Natica**" ("**Naticarius**") **semilunata** Lea	114
7.	**Sinum bilix** (Conrad)	139
8.	**Sinum arctatum** (Conrad)	141
9.	**Scalaria carinata** Lea	97
	Under **Cirsotrema (Coroniscala) nassula** (Conrad)	
10.	**Sinum declive** (Conrad)	140
11.	**Natica minima** Lea	115
	Under "**Natica**" ("**Naticarius**") **semilunata** Lea	
12.	**Natica ætites** Conrad	125
	Under **Neverita limula** (Conrad)	
13.	**Neverita limula** (Conrad)	125
14.	**Natica parva** Lea	121
	Under **Polinices eminula** (Conrad)	
	No. 5520, A. N. S. not lectotype	
15.	**Polinices arata** (Gabb)	123
	Lower Claiborne: Texas	
16.	**Neverita limula** (Conrad)	125

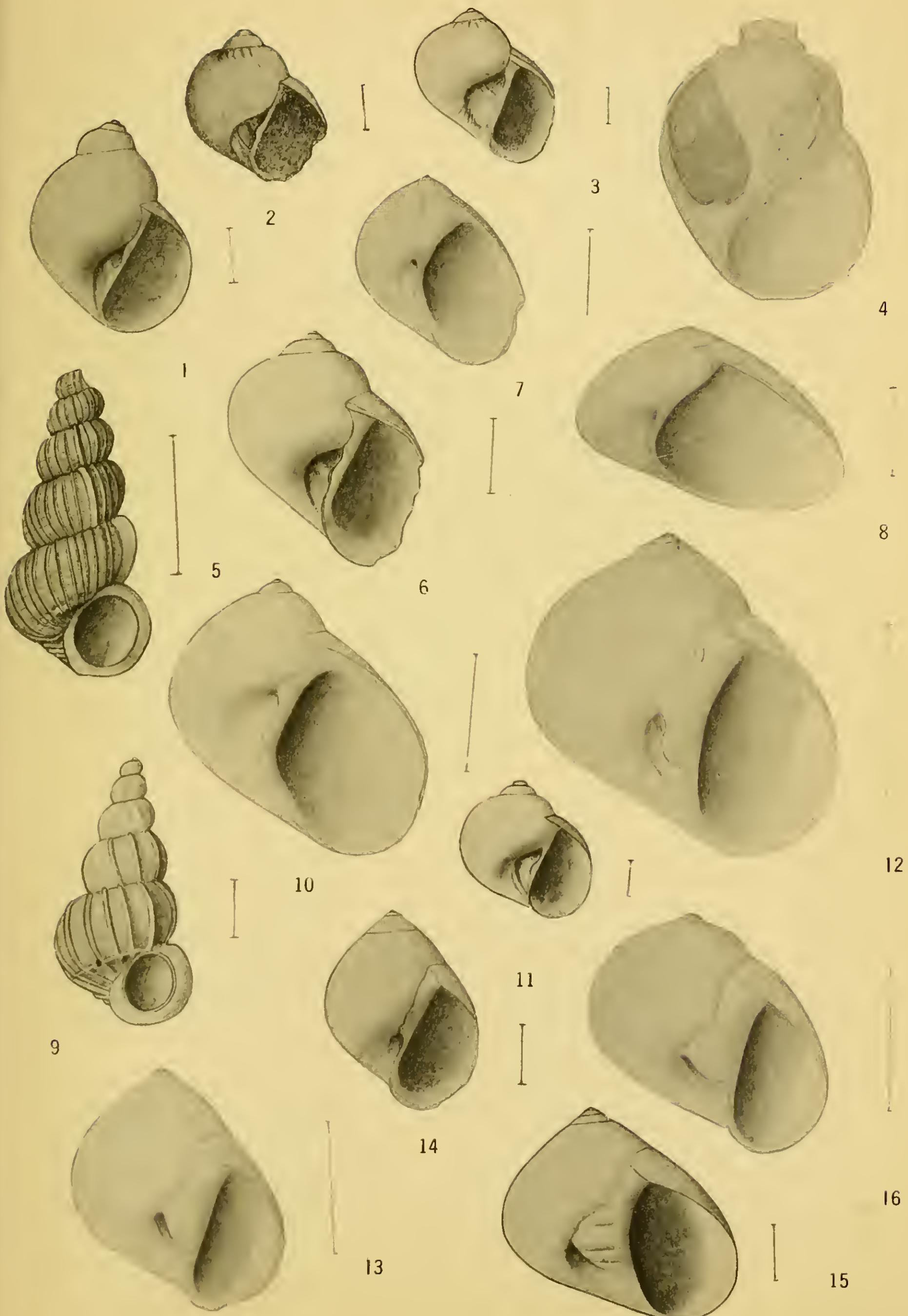

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

PLATE 81

EXPLANATION OF PLATE 81

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All came from the Gosport sand, Claiborne, Ala. unless otherwise noted.

Figure		Page
1.	**Architectonica acuta meekiana** Gabb Lower Claiborne: Texas	168
2.	**Architectonica acuta meekiana** Gabb Lower Claiborne: Texas	168
3.	**Architectonica scrobiculata** (Conrad)	171
4.	**Architectonica scrobiculata** (Conrad) Ventral view of fig. 3	171
5.	**Architectonica scrobiculata** (Conrad) Side view of fig. 3	171
6.	**Solarium Henrici** Lea Under **Architectonica fungina** (Conrad)	162
7.	**Solarium Henrici** Lea Side view of fig. 6	162
8.	**Solarium Henrici** Lea Ventral view of fig. 6	162
9.	**Solarium ornatum** Lea Under **Architectonica elaborata** (Conrad)	164
10.	**Solarium ornatum** Lea Ventral view of fig. 9	164
11.	**Solarium ornatum** Lea Dorsal view of fig. 9	164
12.	**Architectonica texana** Gabb Under **Architectonica scrobiculata** (Conrad)	172
13.	**Architectonica elaborata** (Conrad)	164
14.	**Architectonica elaborata** (Conrad)	164
15.	**Architectonica texana** Gabb Side view of fig. 12	172

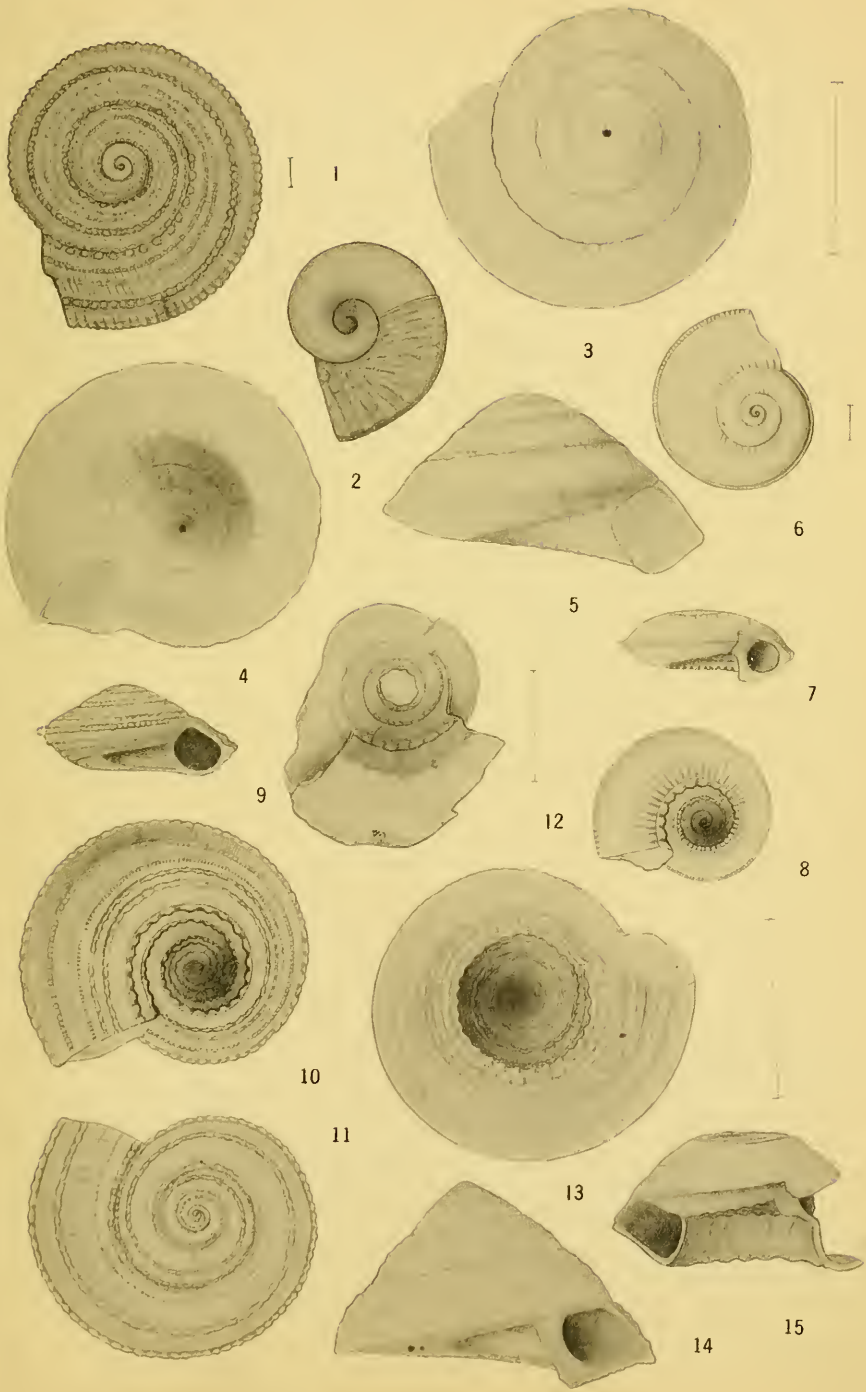

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

PLATE 82

EXPLANATION OF PLATE 82

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All came from Gosport sand, Claiborne, Ala. unless otherwise noted.

Figure		Page
1.	**Turritella gracilis** H. C. Lea	190
	Under **Turritella carinata** Lea	
2.	**Architectonica vespertina** Gabb	168
	Lower Claiborne: Caldwell Co., Texas	
3.	**Architectonica cælatura** Conrad	160
4.	**Architectonica vespertina** Gabb	168
	Same specimen as fig. 2	
5.	**Architectonica cælatura** Conrad	160
	Side view of fig. 3	
6.	**Pasithea striata** Lea	68
7.	**"Bayania" secale** (Lea)	184
8.	**Architectonica fungina** (Conrad)	162
9.	**Architectonica amœna** (Conrad)	161
10.	**Architectonica fungina** (Conrad)	162
	Side view of fig. 8	
11.	**Turritella obruta** Conrad	203
12.	**Actæonema sulcata** (Lea)	157
13.	**Helcion leanus** Gabb	149
	Under **Hipponix pygmæus** Lea	
	Lower Claiborne: Wheelock or Caldwell Co., Texas	
14.	**Helcion leanus** Gabb	
	Same specimen as fig. 14	
15.	**Architectonica fungina** (Conrad)	162
	Dorsal view of figs. 8, 10	
16.	**Architectonica amœna** (Conrad)	161
	Side view of fig. 9	
17.	**Architectonica amœna** (Conrad)	161
	Dorsal view of fig. 9	

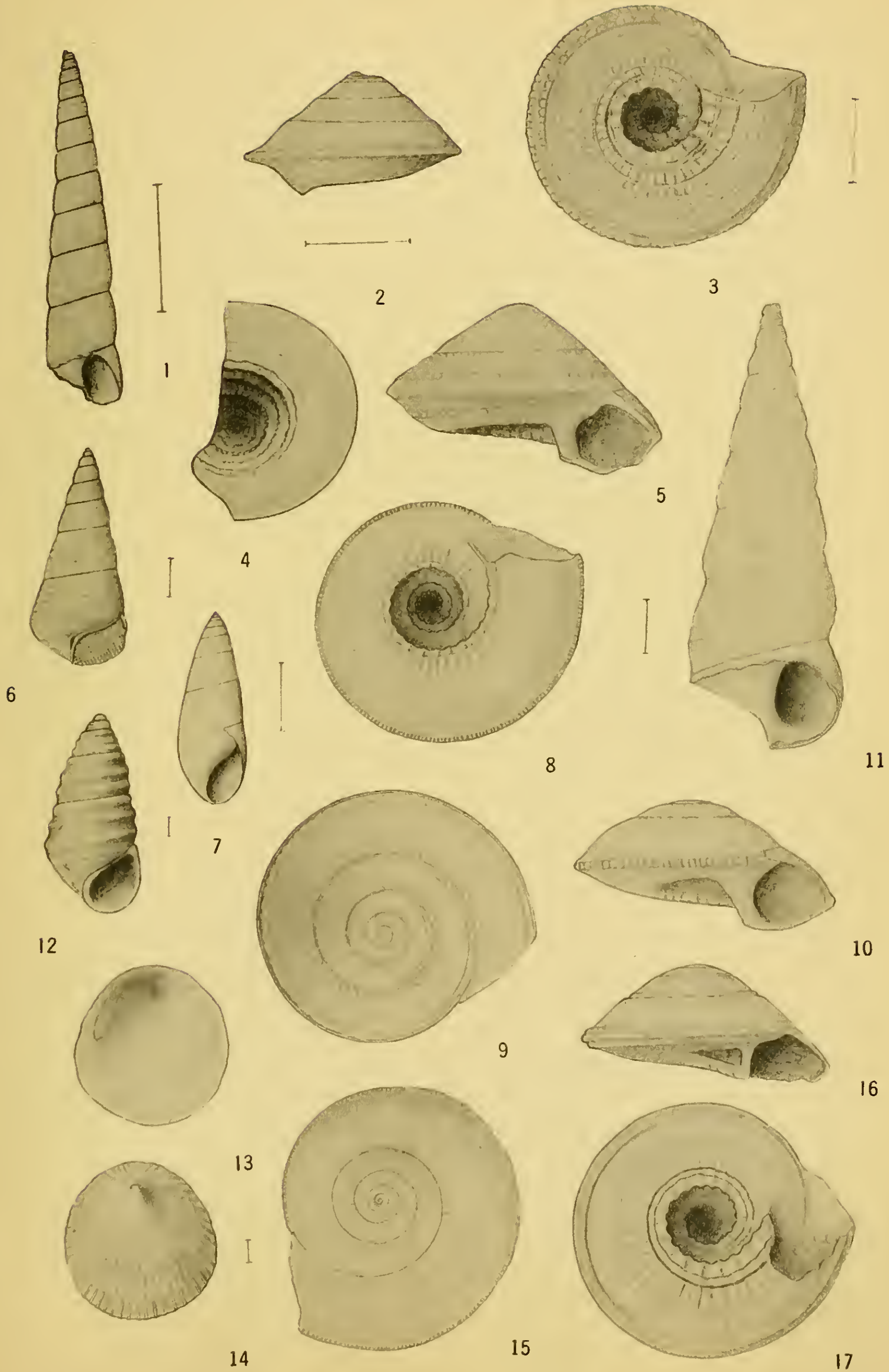

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

PLATE 83

EXPLANATION OF PLATE 83

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All came from the Gosport sand, Claiborne, Ala. unless otherwise noted.

Figure		Page
1.	**Turritella monilifera H. C. Lea**	191
	Under **Turritella ghigna** de Gregorio	
2.	**Cerithiella nassula** (Conrad)	224
3.	**"Cerithium" claibornense** Conrad	216
4.	**"Cerithium" solitarium** Conrad	215
5.	**Turritella nasuta** Gabb	200
	Lower Claiborne: Texas	
6.	**Elimia trigemmata** (Conrad)	186
7.	**Buccinum Sowerbii** Lea	253
	Under **Sconsia (Doliocassis) nupera** (Conrad)	
8.	**Bittium (Stylidium) elegans** (H. C. Lea)	219
9.	**Phalium brevicostatum** (Conrad)	248
10.	**Phalium Taitii** (Conrad)	251
11.	**Sconsia (Doliocassis) nupera** (Conrad)	253


1
2
3
4
5
6
7
8
9
10
11

PLATE 84

EXPLANATION OF PLATE 84

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All came from the Gosport sand, Claiborne, Ala.

Figure		Page
1.	**Murex Vanuxemi** Conrad	263
2.	**Leiorhinus prorutus** (Conrad)	247
3.	**Triton pyramidatus** H. C. Lea Under **Ranellina sulcata** (Lea)	259
4.	**Mitrella (Columbellopsis) elevata** (Lea)	280
5.	**Ranella maclurii** Conrad Under **Ranellina sulcata** (Lea)	259
6.	**Murex engonatus** Conrad	267
7.	**Mitrella (Columbellopsis) parva** (H. C. Lea)	277
8.	**Ranella maclurii** (Conrad) Under **Ranellina sulcata** (Lea) Lectotype	259
9.	**Fusus minor** Lea Under **Leiorhinus prorutus** (Conrad)	247
10.	**Murex (Phyllonotus) Mantelli** (Conrad)	269
11.	**Ranellina sulcata** (Lea)	259

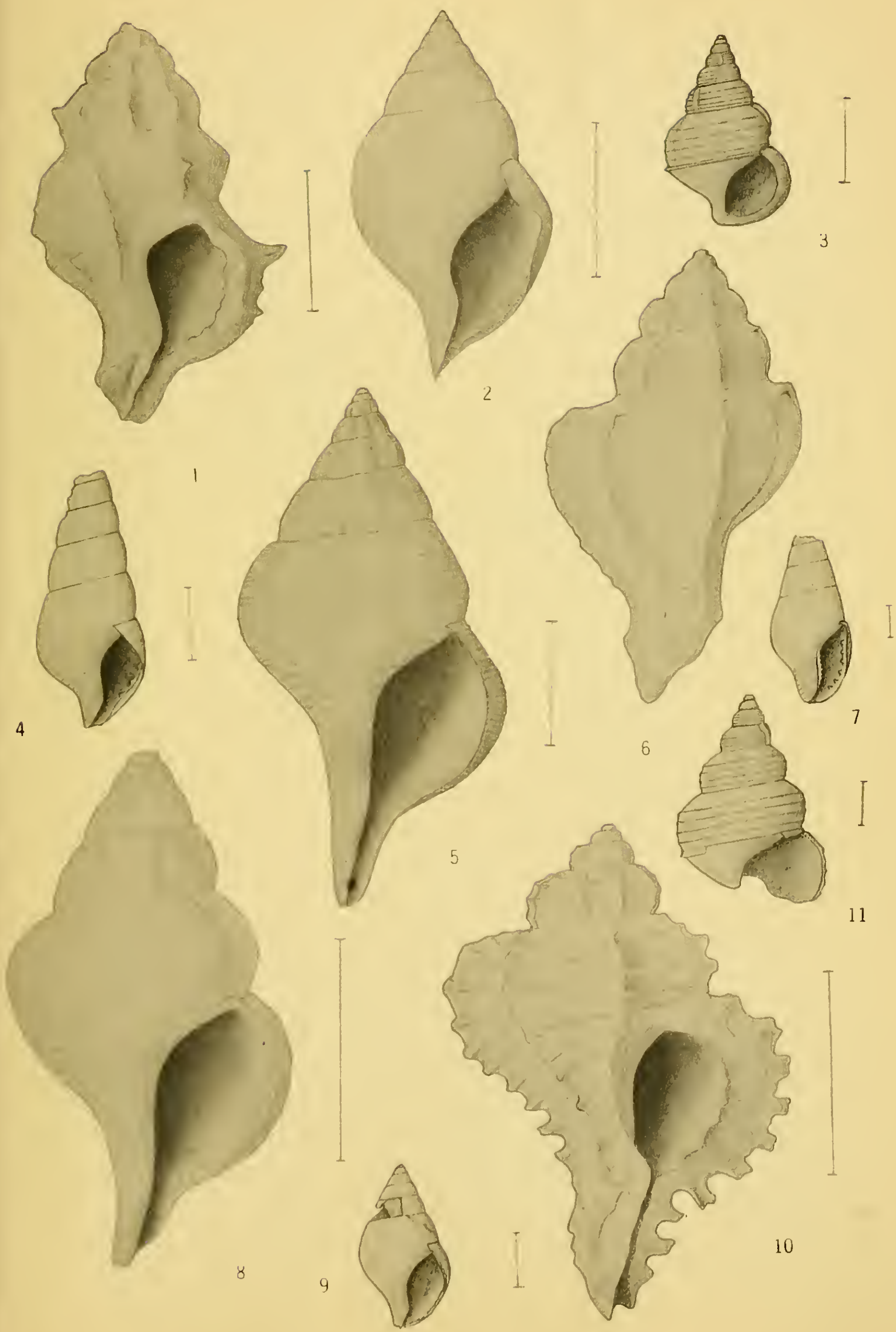

1
2
3
4
5
6
7
8
9
10
11

PLATE 85

EXPLANATION OF PLATE 85

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All came from the Gosport sand, Claiborne, Ala. unless otherwise stated.

Figure		Page
1.	**Buccitriton texanus** (Gabb)	305
	Lower Claiborne: Texas	
2.	**Fusus bicarinatus** Lea	326
	Under **Levifusus trabeatus** (Conrad)	
3.	**Monoptygma lymneoides** (Conrad)	296
4.	**Pseudoliva carinata** (Conrad)	313
	Under **Pseudoliva vetusta perspectiva** Conrad	
5.	**Pyramimitra terebræformis** (Conrad)	274
6.	**Monoceros fusiformis** Conrad	314
	Under **Pseudoliva vetusta** var.	
	Lower Claiborne: Wheelock, Texas	
7.	**Monoptygma alabamiensis** Lea	296
	Under **Monoptygma lymneoides** (Conrad)	
8.	**Monoptygma curta** Conrad	298
9.	**Fusus parvus** Lea	247
	Under **Leiorhinus prorutus** (Conrad)	
10.	**Verconella Delabechii** (Lea)	319
11.	**Fusus magnocostatus** Lea	321
	Under **Verconella bella** (Conrad)	
12.	**Typhis gracilis** Conrad	271
13.	**Mazzalina inaurata pyrula** Conrad	350
14.	**Terebra costata** Lea	274
	Under **Pyramimitra terebræformis** (Conrad)	

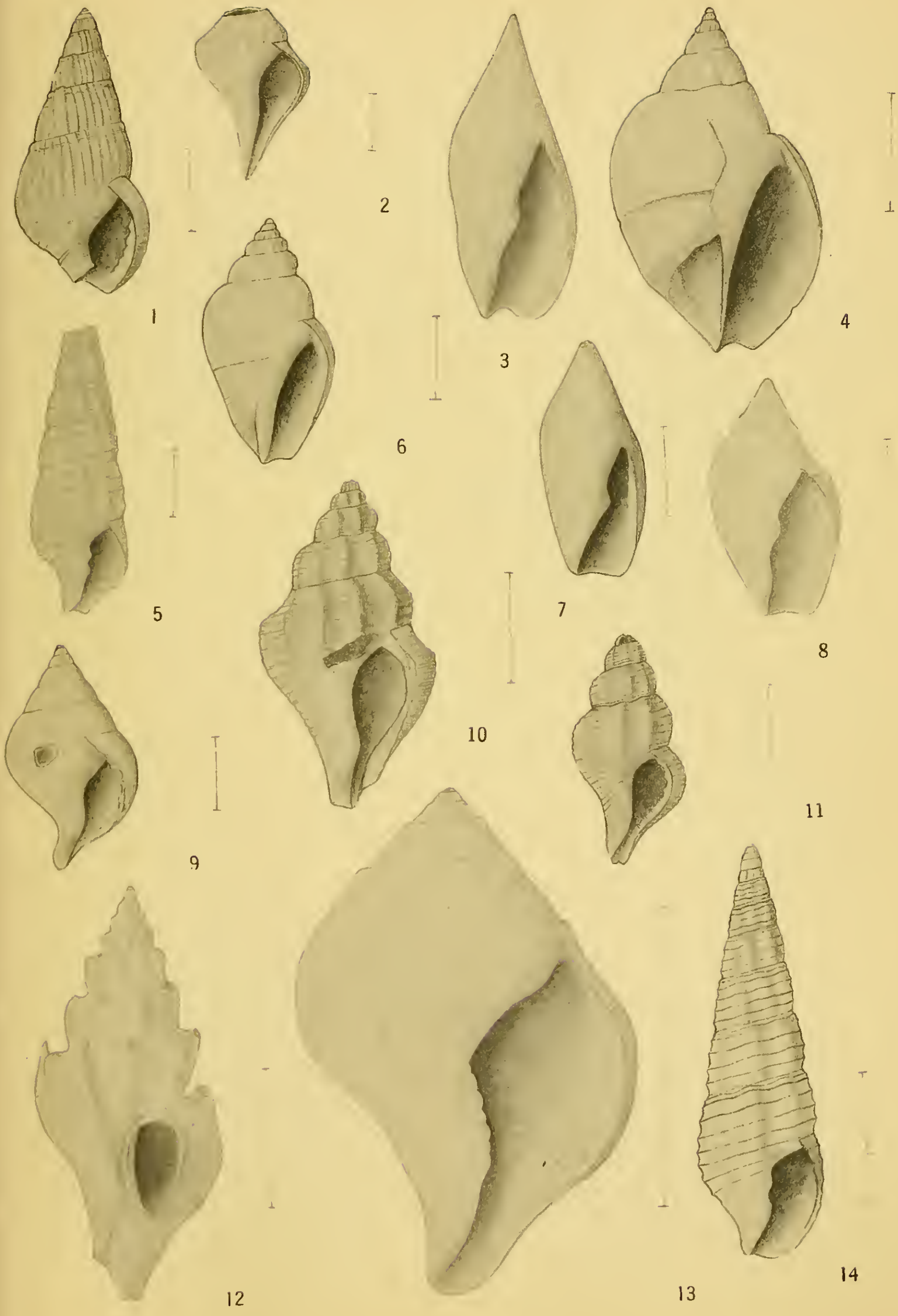

1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 86

EXPLANATION OF PLATE 86

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All came from the Gosport sand, Claiborne, Ala. unless otherwise noted.

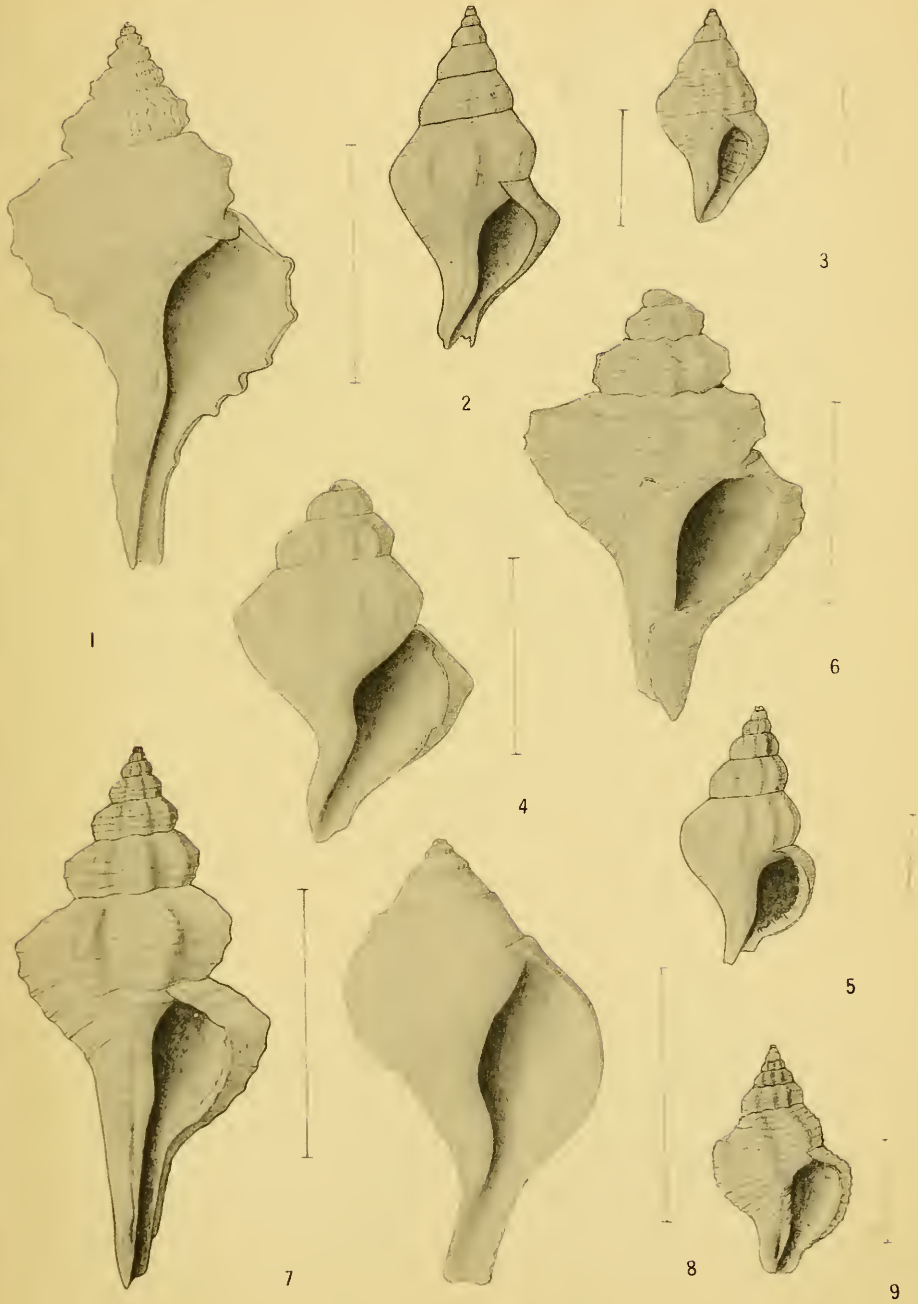

1
2
3
4
5
6
7
8
9

PLATE 87

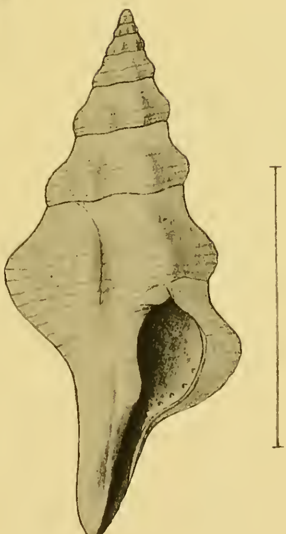
EXPLANATION OF PLATE 87

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All are from the Gosport sand, Claiborne, Ala. unless otherwise noted.

Figure		Page
1.	**Latirus plicatus** (Lea) Conradian specimen	341
2.	**Latirus plicatus** (Lea)	341
3.	**Latirus moorei** (Gabb) Lower Claiborne: Texas	342
4.	**Latirus (Dolicholatirus) perexilis** (Conrad) Vicksburg Oligocene	344
5.	**Exilifusus thalloides** (Conrad)	356
6.	**Fusus pulcher** Lea Under **Exilifusus thalloides** (Conrad)	356
7.	**Fusus acutus** Lea Under **Streptochetus limulus** (Conrad)	346

1

2

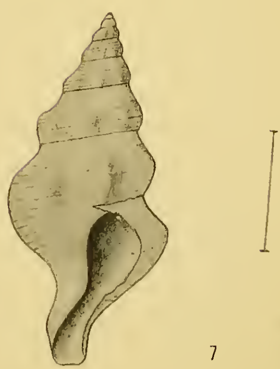


3

4

5

6



7

PLATE 88

EXPLANATION OF PLATE 88

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All are from the Gosport sand, Claiborne, Ala. unless otherwise noted.

Figure		Page
1.	**Volutilithes indentus** Conrad Under **Athleta petrosa** (Conrad) "Texas?"	372
2.	**Fusimitra polita** (Gabb) Lower Claiborne: Caldwell Co., Texas	407
3.	**"Papillina" Cooperi** (Conrad)	365
4.	**Terebrifusus multiplicatus** (H. C. Lea)	308
5.	**Mitra minima** Lea Under **Fusimitra perexilis** (Conrad)	406
6.	**Voluta gracilis** Lea Under **Athleta sayana** (Conrad)	376
7.	**Voluta parva** Lea Under **Athleta petrosa** (Conrad)	372
8.	**Mitra lineata** Lea Under **Vexillum (?Uromitra) terplicatum** (de Gregorio)	401
9.	**"Papillina' Cooperi** (Conrad) Same specimen as fig. 3	365
10.	**Mitra elegans** H. C. Lea Under **Terebrifusus amœnus** (Conrad)	307
11.	**Volutilithes impressus** Conrad Under **Athleta petrosa** (Conrad) Texas	372
12.	**Lapparia mooreana** (Gabb) Lower Claiborne: Caldwell Co., Texas	387
13.	**Terebrifusus amœnus** (Conrad)	307
14.	**Terebra gracilis** Lea Under **Terebrifusus amœnus** (Conrad)	307


1
2
3
4
5
6
7
8
9
10
11
12
13
14

PLATE 89

EXPLANATION OF PLATE 89

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All are from the Gosport sand, Claiborne, Ala. unless otherwise noted.

Figure		Page
1.	**Vexillum (Uromitra) gracile** (H. C. Lea)	402
2.	**Cancellaria sculptura** Lea Under **Sveltia alveata** (Conrad)	446
3.	**Voluta Parkinsonii** Lea Under **Caricella pyruloides** (Conrad)	390
4.	**Voluta dubia** H. C. Lea Under **Lapparia pactilis** (Conrad)	385
5.	**Oliva gracilis** Lea Under **Agaronia alabamensis** (Conrad)	431
6.	**Sveltella parva** (Lea)	447
7.	**Marginella columba** Lea	419
8.	**Voluta striata** Lea Under **Caricella prætenuis** (Conrad)	394
9.	**Vexillum (Uromitra) exile** (Gabb) Lower Claiborne: Texas	403
10.	**Marginella anatina** Lea Under **Marginella silabra** Palmer	417
11.	**Caricella doliata** (Conrad)	391
12.	**Mitra eburnea** H. C. Lea Under **Fusimitra perexilis** (Conrad)	406
13.	**Marginella ovata** Lea Under **Persicula (Bullata) larvata** (Conrad)	421
14.	**Marginella incurva** Lea Under **Marginella columba** Lea	419
15.	**Trigonostoma babylonicum** (Lea)	437
16.	**?Persicula (Bullata) semenoides** (Gabb) Lower Claiborne: Texas	426
17.	**Cancellaria tessellata** Lea Under **Sveltia alveata** (Conrad)	446

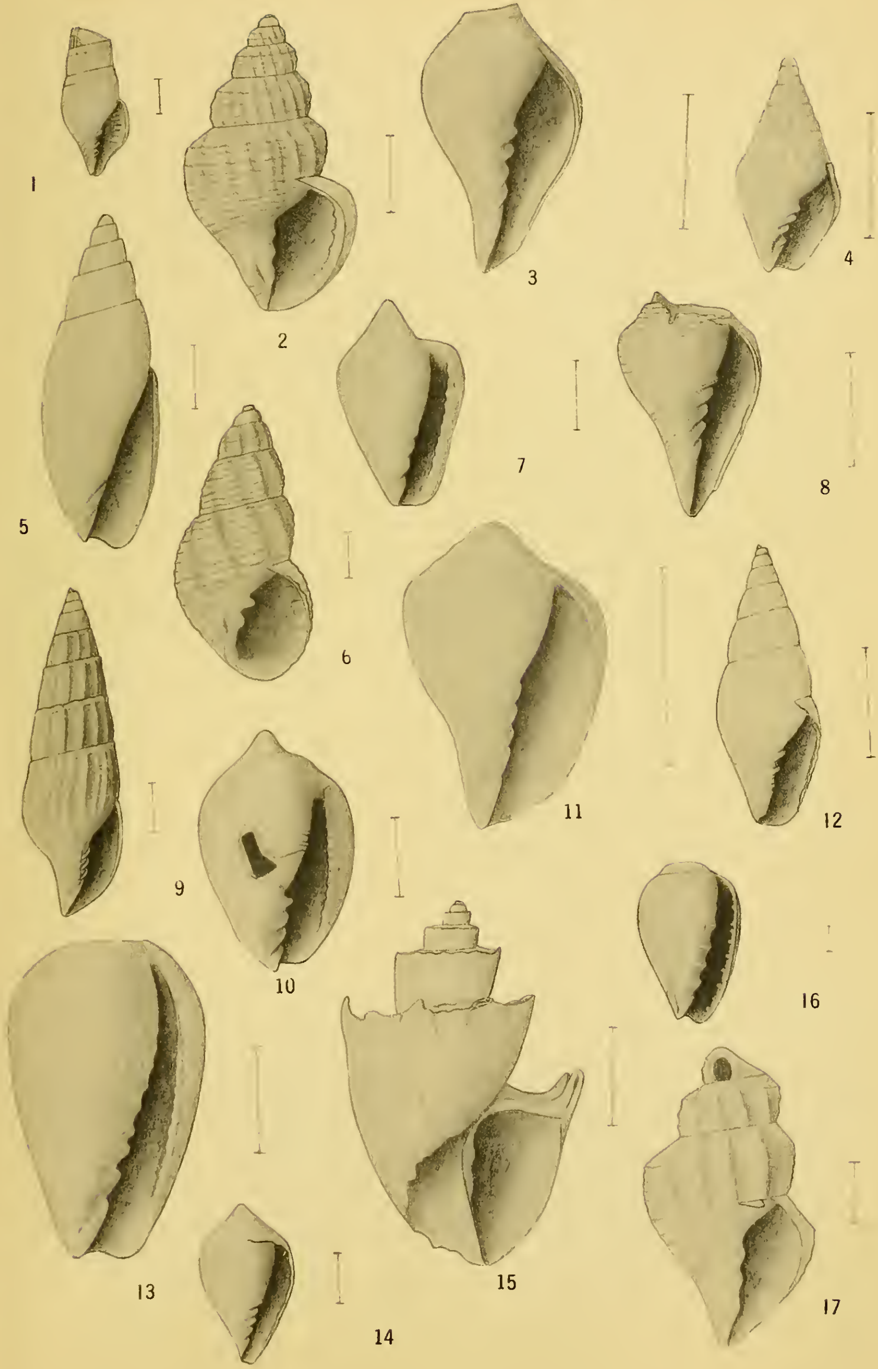
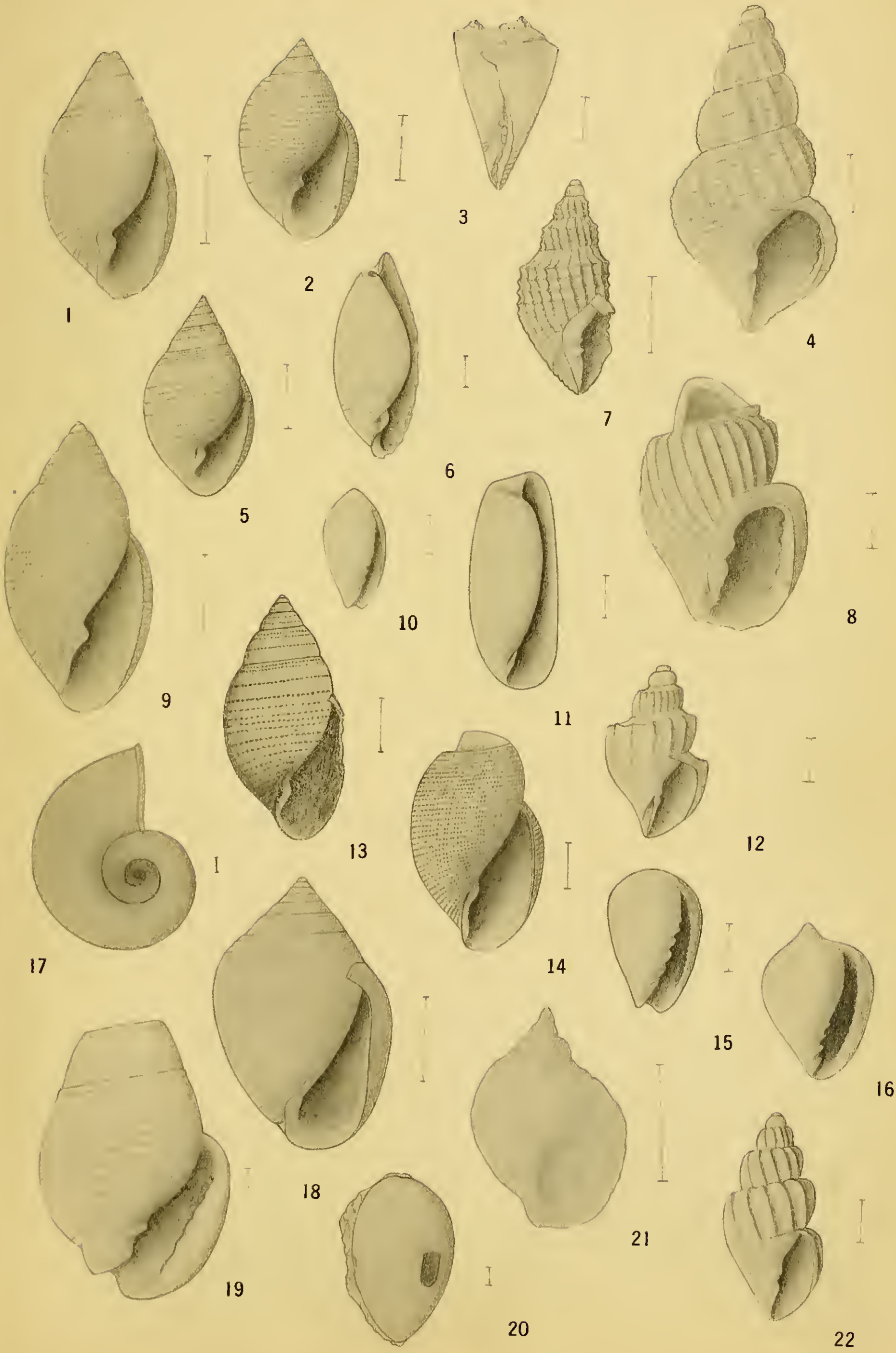

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

PLATE 90

EXPLANATION OF PLATE 90

Type figures drawn by Otto Meyer. Specimens are in the A. N. S., Philadelphia, Pa. All are from the Gosport sand, Claiborne, Ala. unless otherwise stated.

Figure		Page
1.	**Acteon idoneus** Conrad	500
2.	**Acteon pomilius punctatus** Lea	499
3.	Conus parvus H. C. Lea	458
	Under **Conus (Lithoconus) sauridens** Conrad. Young	
4.	**Bonellitia elevata** (Lea)	450
5.	**Acteon lineatus** Lea	500
	Under **Acteon idoneus** Conrad	
6.	**Mnestia Dekayi** (Lea)	483
7.	**Trigonostoma pulcherrimum** (H. C. Lea)	440
8.	**Cancellaria multiplicata** Lea	438
	Under **Trigonostoma gemmatum** (Conrad)	
9.	**Acteon pomilius** Conrad	496
10.	**Persicula (Bullata) semen minima** (Lea)	425
11.	**Cylichnina Kellogii** (Gabb)	481
	Lower Claiborne: Texas	
12.	**Cancellaria plicata** Lea	438
	Under **Trigonostoma gemmatum** (Conrad)	
13.	**Tornatella bicincta** Heilprin	500
	Under **Acteon idoneus** Conrad	
14.	**Monoptygma elegans** Lea	496
	Under **Acteon pomilius** Conrad	
15.	**Persicula (Bullata) semen** (Lea)	422
16.	**Marginella crassilabra** Lea non Conrad	419
	Under **Marginella columba** Lea	
17.	**"Planaria" nitens** Lea	474
18.	**Nucleopsis subvaricatus** (Conrad)	502
19.	**Ringicula biplicata** (Lea)	475
20.	**"Volvula minutissima"**	489
	non **V. minutissima** Gabb, 1860	
	Under **Atys atyopsis** (Harris). Texas	
21.	**Tornatellæa lata** Conrad	501
	Under **Tornatellæa bella** Conrad	
22.	**Cancellaria costata** Lea	438
	Under **Trigonostoma gemmatum** (Conrad)	


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22