

Eight new species of Eocene Gastropoda from Texas based on the Megahan collection

Christopher L. Garvie

Non-vertebrate Paleontology Laboratory, Texas Natural Science Center, The University of Texas at Austin, 10100 Burnet Road, Austin, Texas 78758, U.S.A., email: clgarvie@gmail.com

Abstract.—This publication describes new species found by Mr. Donald Megahan and his family while collecting at three Eocene, Cook Mountain Formation, Claiborne Group, localities in central Texas. The following eight new species are proposed: *Pliciscala obliqua*, *Papuliscaea keani*, *Conradconfusus nodulinus*, *Terebrifusus megahani*, *Orthosurcula ethani*, *Unitas duomillias*, *Ringicula taenia*, and *Syrnola debrae*.

Keywords: Middle Eocene, new species, Texas

The specimens described in this paper came from two localities in the middle Claiborne Group Eocene. The locality designations used are from the registry of the Bureau of Economic Geology, University of Texas (BEG). A partial set of the BEG stratigraphic localities can be consulted in Fisher et al. (1964:96–101). The molluscan fauna of the Eocene, middle Claibornian is generally quite well known (Harris 1937, Palmer 1937), those strata having been collected since the early 19th century in the southeastern United States and since the late 19th century in the western Gulf region. The smaller-sized taxa are much less well known, often only represented by only one, or very few specimens, so additions like these new taxa give an increasingly complete view of the middle Eocene fauna.

Collection Localities

BEG locality: 26-T-1.—This well-known locality is much visited by local collectors and is the type locality of the Stone City Member of the Cook Mountain Forma-

tion. The stratigraphy, beds, location, and bivalve fauna were comprehensively treated in Stenzel et al. (1957). Bed designations, where used in the text, are those defined in Stenzel et al. (1957:22–25). The original location was given as the right bank of the Brazos River, immediately upstream from the bridge of State Highway 21 and Southern Pacific Railroad, Burleson County, Texas. The GPS coordinates of the original site are: 30°37'40.05"N, 96°32'51.91"W. Local collectors have since exposed about an additional 600+ m of fossiliferous outcrops downstream from the original site.

BEG locality: 143-T-83.—In bed of Spring Branch of Two Mile Creek, west of the bridge over U.S. Highway 75, and about 3.2 km north of the Madison-Leon County line, Leon County, Texas, GPS coordinates are: 31°07'4.66"N, 95°56'40.88"W. Landrum Member, Cook Mountain Formation. The geology and stratigraphy of Leon County is discussed in Stenzel (1938).

BEG locality: 21-T-1.—Banks and creek bed of Little Brazos River, about 160 m upstream of Highway 21 bridge, and about 14 km WSW of Bryan, Texas. GPS

coordinates are: 30°38'39.50"N, 96°31'13.48"W. Cook Mountain Formation, Wheelock Member. The locality is discussed in Scott (1963).

Materials and Methods

Unlike many in the local fossil collecting community who often only surface collect, or excavate for the larger specimens, Mr. Megahan and his family also assiduously collected bulk samples which were taken to his home for further processing. After disaggregation, the sediments were examined under a binocular microscope, the interesting specimens picked out, cleaned, and many also photographed. The author was given access to the photographic images, and those fossils that appeared to be new species were sent to the author for further examination. Those specimens that became types were generously donated to the Non-Vertebrate Paleontology Laboratory (NPL) of the University of Texas at Austin.

This work has been registered in ZooBank with the registration number: urn:lsid:zoobank.org:pub:33DE7BF6-87C1-4F25-BE1D-C56836C8D863.

Systematics

Class Gastropoda Cuvier, 1795
 Subclass Caenogastropoda Cox, 1960
 Superfamily Epitonioidae S. S. Berry, 1910
 Family Epitoniidae S. S. Berry, 1910
 Genus *Pliciscala* de Boury, 1887

Type species.—*Scalaria gouldi* De-shayes, 1861, by original designation.

Pliciscala obliqua, new species
 Fig. 1A, B

ZooBank LSID.—urn:lsid:zoobank.org:act:75861C18-62BA-47BC-8920-0B81267838CF

Material examined.—One specimen, holotype, NPL 93894, from locality BEG 26-T-1, bed S.

Diagnosis.—*Pliciscala* species, with spire angle ca. 23°, occasional prominent varices, whorls evenly rounded, surface with minutely punctate spiral grooves, umbilical chink present.

Description.—Whorls 9, protoconch missing, first 2½ teleoconch whorls decorticated; teleoconch whorls inflated, suture impressed, ca. 14 axial ribs on early whorls increasing to 20 on the body whorl, 3 ribs much larger, varix-like; whorl surface covered with extremely fine spiral grooves that are minutely punctate; basal disc poorly defined by a weak carina, somewhat nodular where crossed over by the axials that continue much diminished over the disc; aperture elliptical, holostomous, outer lip with a prominent varix, just behind the edge, set at a prosocline oblique angle to the shell axis; small umbilicus.

Etymology.—The name *obliqua* (Latin, oblique) refers to the prosocline oblique varices of this species.

Remarks.—The closest species to *Pliciscala obliqua* is the upper Eocene species *Pliciscala pearlensis* (Meyer, 1887), which until recently was only known from a single specimen. Dockery (1977:pl. 3, fig. 12) figured another specimen, which, however, appears very worn and has the axial folds almost completely effaced on the body whorl. On the holotype of *P. pearlensis*, the folds continue over the basal area, with no apparent basal disc discernable; the description also noted that the protoconch has 4 whorls. Quite similar is an undescribed specimen from the Weches Formation; this specimen has 3 smooth erect whorls (tip missing), the transition to teleoconch whorls defined by a sinuous ridge; teleoconch whorls with 20 ribs on the body whorl, and almost no discernable basal disc; this specimen is deposited in the NPL collections and is designated NPL 93901. Species both with, and without a basal disc have been placed

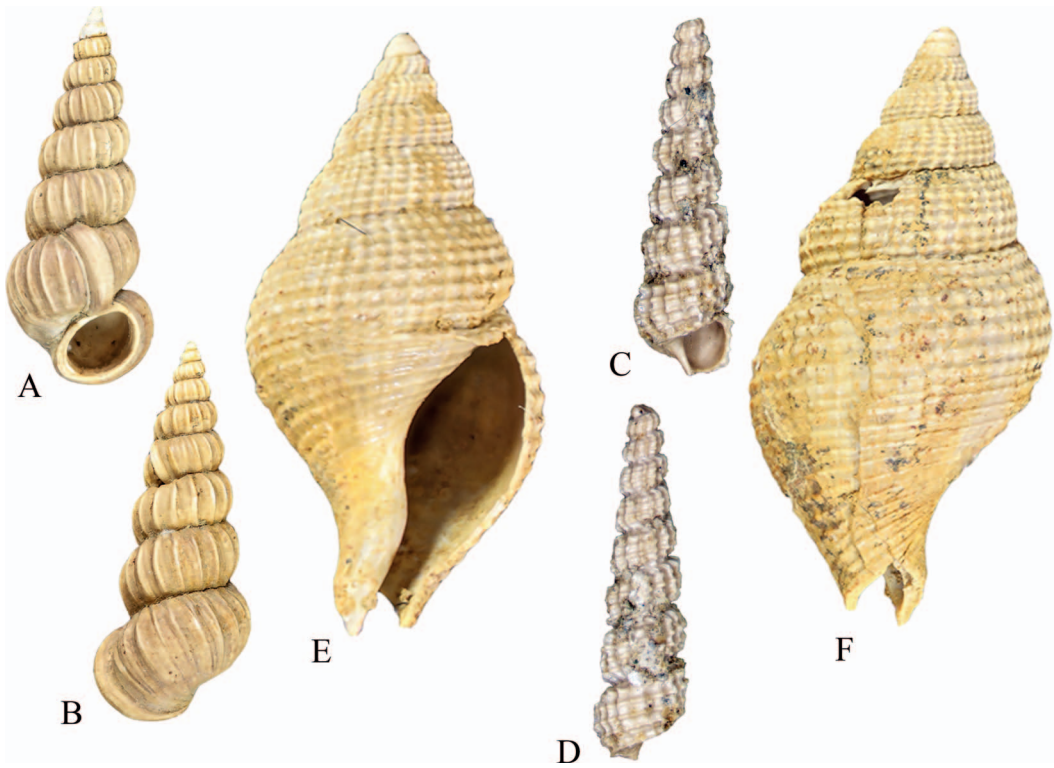


Fig. 1. *Pliciscala obliqua*. A, apertural, B, dorsal views of holotype, NPL 93894, 13.9 mm height, from locality BEG 26-T-1. *Papuliscala keani*. C, apertural, D, right lateral views of holotype, NPL 93895, 3.9 mm height, from locality BEG 21-T-1. *Conradconfusus nodulinus*. E, apertural, F, dorsal views of holotype, NPL 93889, 13.5 mm height, from locality BEG 143-T-83.

in the genus *Pliciscala*. The type, *P. gouldi* (Deshayes, 1861) has a well-defined basal disc margined by a spiral cord, as has *Pliciscala cribrum* (Cooke, 1926), another Moodys Branch species. MacNeil & Dockery (1984) discussed and figured four *Pliciscala* species from the Oligocene strata of the Gulf Coast of which *Pliciscala* (*Nodiscala*?) n. sp. appears the closest to *P. obliqua*; this species also has the prosocline oblique varices and a very poorly defined basal disc. However, the author does not agree with the subgeneric assignment to *Nodiscala* de Boury, 1890. Examining the figures of the type species of *Nodiscala*, *Nodiscala bicarinata* (Sowerby, 1844), available at: http://www.gastro-pods.com/7/Shell_6397.shtml (last accessed 2 Aug 2021), the spiral ornament, is seen to be particularly prominent on the

body whorl, as are the subsutural crenulations, a duplex cord margins the basal disc and the final varix is in line with the shell axis, all at variance with the characters of *P. (Nodiscala?)* n. sp. Assignment to *Pliciscala* sensu stricto would appear to be a better match.

Genus *Papuliscala* de Boury, 1911

Type species.—*Acirsa praelonga* Jeffreys, 1877 by original designation.

Papuliscala keani, new species

Fig. 1C, D

ZooBank LSID.—urn:lsid:zoobank.org:act:08A721AC-E708-4169-A9E3-799F3BE17A87

Material examined.—One specimen, holotype, NPL 93895, from locality BEG 21-T-1, bed D.

Diagnosis.—*Papuliscala* species with 4 spiral cords, the interspaces larger than the cords, overrun with numerous similar sized axial ribs, prickly or foliated at the intersections with the spirals.

Description.—Shell very small, early whorls missing, remaining whorls 8; whorls moderately inflated, surface smooth, shining, with thin, foliated (crinkled?) axial ribs, 13 on the first whorl and 19 on the body whorl, the axial ribs straight medially, adaperturally bent subsuturally, abaperturally bent suprasuturally; whorls overrun with 4 spiral cords, nodular where crossing the axial ribs; suture (adpressed) almost invisible, defined by a faint microscopic line; basal disc margined with a strong cord, 2 weaker cords on the disc, overrun by axial threads that are the continuation of the axial ribs; aperture rounded-quadrangular, columella concave; outer lip missing.

Etymology.—This species is named in honor of Mr. Megahan's son Kean for his help in collecting.

Remarks.—This specimen has lost the protoconch whorls, but the weakly carinated whorls, the axial and spiral sculpture, and the smooth basal disc places it in the genus *Papuliscala*. Other taxa that might be confused with this are *Elegantiscala* de Boury, 1911, but that taxon has a weakly concave basal disc and a round aperture, and *Cerithiella* Verrill, 1882, which can be separated by the bent, extended canal and a weak swelling on the columella. The type species *Papuliscala scalariformis* de Folin, 1867, has much more subdued sculpture than *Papuliscala keani*, but several other species assigned to the genus, for example *Papuliscala tavianii* Bouchet & Warén, 1986 also possess a similar foliated, prickly, or noded intersection of the axial and spiral cords. Modern members are restricted to deep water (Bouchet & Warén 1986). The earliest

reported European occurrences of *Papuliscala* are from the Oligocene or early Miocene of France (Lozouet 1999), whereas in the Gulf Coastal plain region the genus occurs in the lower Paleocene of Texas as *Papuliscala acus* Garvie, 2021, from which it can be distinguished by the more carinated whorls and the foliated axial ribs. The two images, Fig. 1C, D, show only partially cleaned specimens as any further removal of matrix would have further damaged the crinkled foliated axial ribs.

Superfamily Buccinoidea Rafinesque, 1815

Family Fascioliidae Gray, 1853

Genus *Conradconfusus* Snyder, 2002

Type species.—*Buccinofusus parilis* Conrad, 1868, by original designation.

Conradconfusus nodulinus, new species

Fig. 1E, F

ZooBank LSID.—urn:lsid:zoobank.org:act:B910092A-2CE9-4C44-8E2B-47A6B959D08A

Material examined.—Holotype, NPL 93889, from locality BEG 143-T-83. A second specimen collected by the author from the Stone City Formation, is in the NVP collection catalogued as NPL 93902.

Diagnosis.—Small *Conradconfusus* species, with evenly rounded whorls, sculpture of equi-sized weakly opisthocline axial and spiral cords forming a close mesh pattern, nodular at their intersections.

Description.—Nucleus enrolled, deviated, protoconch of 2¼ smooth whorls, followed by 1/8 whorl of ribbles, smoothly transitioning to the adult sculpture; teleoconch of 5½ whorls, inflated, early whorls somewhat posteriorly stepped, later ones smoothly rounded; sculpture of numerous opisthocyrt axial folds, overrun by 7 spiral cords, the intersection finely beaded; suture moderately impressed, axial sculpture dying out approaching the canal; callus wash thin over parietal region; outer

lip broken but showing weak spiral grooves in the interior. columella sinuous, smooth, medially straight, the edge abaperturally delineated by a fine line; canal moderate in length bent to the left.

Etymology.—The name *nodulinus* refers to the noded intersections of the spiral and axial lines.

Remarks.—The species might be considered for assignment in *Mitrella* Risso, 1826. However, the protoconch of that taxon has 1½ inflated whorls with no ribbles, an absent or very short anterior canal, and no anterior constriction of the outer lip. Assignment may also be considered in *Metula*, H. Adams & A. Adams, 1853, where several of those species have a similar external whorl sculpture, e.g., *Metula reticulata* Garvie, 2013, from the upper Paleocene Seguin Formation of Texas, and *Metula gracilis* Johnson, 1899, from middle Eocene, Cook Mountain Formation of Texas. Both of these species have much coarser whorl sculpture, possess varices or at least one terminal varix, and a fairly short canal so are easily separated from *Conradconfusus nodulinus*. Much closer is *Metula (Caseyella) neptuneiformis* MacNeil, 1984, from the Oligocene, Red Bluff Formation of Mississippi, which has a similar sculptural mesh-like pattern of curved axial ribbles and spiral threads, not, however, nodular at their intersections. One distinguishing characteristic of both *Metula* sensu stricto and *Metula (Caseyella)* species is a tall conical protoconch, quite different from that of taxon *Conradconfusus*. Wenz (1944) recorded *Conradconfusus* from the upper Cretaceous in Europe and West Africa to the Recent. In the U.S.A. the genus is known from Danian strata of Texas (Garvie 2021), and a very similar but undescribed species occurs in the Gosport Sand Formation in Little Stave Creek in Alabama (pers. obs.); the present species may be distinguished from those by the more regularly rounded whorls and regular fine beading. The type, *Conradconfusus parilis* (Conrad, 1830), which is common

in the Miocene St Mary's Formation of Maryland, is a much larger species with both stronger axial and spiral ornament.

Family Buccinidae Cossmann, 1906
Genus *Terebrifusus* Conrad, 1865

Type species.—*Buccinum amoenum* Conrad, 1833, by monotypy.

Terebrifusus megahani, new species
Fig. 2A–C

ZooBank LSID.—urn:lsid:zoobank.org:act:1A2DD10A-E55B-4D58-BC55-F2B3C8BA8197

Material examined.—Nineteen specimens. Four specimens from locality BEG 143-T-83; holotype, NPL 93899, paratype (a juvenile), NPL 93900. An additional 15 specimens from the Cook Mountain Formation, Wheelock Member, in central Texas were also examined.

Diagnosis.—*Terebrifusus* species with regularly spaced distinct axials overrun by 5 or 6 rounded spiral cords, nodular at their intersections. On the body whorl the spiral cords become closer together approaching the canal. Siphonal fasciole prominent.

Description.—Protoconch smooth, of 1½ whorls, tip enrolled, followed by ½ whorl of arcuate ribbles; transition to teleoconch abrupt; teleoconch, polished, of 4 whorls, with 9–10 distinct axial ribs and 6 spiral cords, nodular at the intersections, later whorls with a smaller spiral in the interfaces; last whorl with sharp outer lip and a broad varix-like axial set back from the edge; aperture lanceolate, columella with 3 plaits in the juvenile, 5 or 6 prominent in the adult; canal notched, short, twisted, siphonal fasciole strong composed of numerous closely-set cords, one larger one defining the adapertural edge.

Etymology.—Honoring Mr. Donald Megahan in recognition of his work in collecting, preparing, and donating these new species to the NPL.

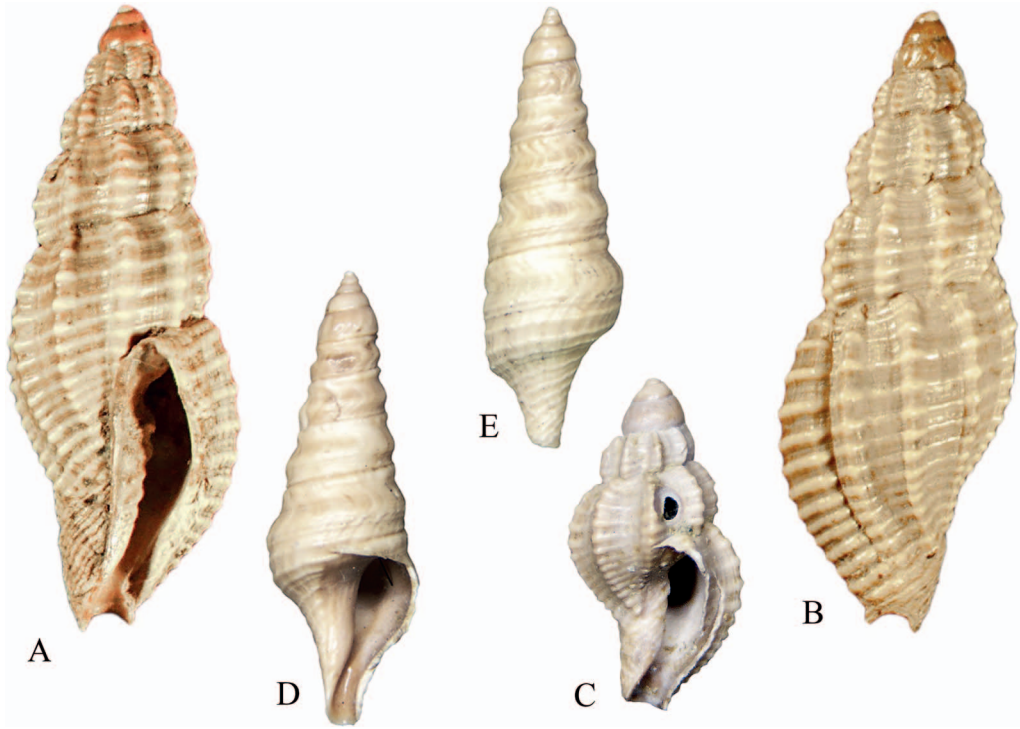


Fig. 2. *Terebrifusus megahani*. A, apertural, B, dorsal views of holotype, NPL 93899, 9.2 mm length; C, apertural view of paratype, NPL 93900, 4.1 mm length, both from locality BEG 143-T-83. *Orthosurcula? ethani*. D, apertural, E, dorsal views of holotype, NPL 93890, 6.0 mm height, from locality BEG 21-T-1.

Remarks.—Palmer (1937:307–308) discussed the differences between *T. amoenus* (Conrad, 1833) and *T. multiplicatus* (H. C. Lea, 1841) and mentioned the more finely striated appearance and larger longitudinal ribs of *T. multiplicatus*. The types of both those taxa come from the Gosport Sand Formation at Claiborne Bluff, but both species are also found in middle Claibornian strata of the Gulf States and South Carolina. Genus *Terebrifusus* is now known to range back to the upper Paleocene (Garvie 2013:45). The author has collected over 165 specimens of taxon *Terebrifusus* from the Gulf Coast Eocene, and 4 specimens from upper Paleocene strata of Texas and Alabama, and even though there is considerable variation in characters, there are two major groupings exemplified by *T. amoenus* and *T. multiplicatus*. *Terebrifusus amoenus* is charac-

terized by fairly regularly spaced, raised spiral lines, the interspaces themselves sometimes, also with weaker, but always raised spiral lines. The protoconch is small, conical, with 2–2½ smooth whorls followed by ½–¾ whorl of arcuate ribblets. The new species, *T. megahani*, is separated from the typical *amoenus* group by the much stronger primary spirals that are always nodular where they cross over the longitudinal folds. Specimens intermediate in character between the two groups have not been found supporting a new species definition. The *multiplicatus* group is characterized by the spiral sculpture defined by impressed, not raised, lines, giving a much smoother surface to the species, while the protoconch is larger, with 2 smooth whorls followed by ½ of ribblets and with a blunt tip. The *multiplicatus* group has not been observed below the Cook Mountain For-

mation, although a few specimens in the Weches Formation are smoother than the majority and also have a flatter protoconch and probably represent the beginning of the ancestral line. Garvie (1996) identified *T. multiplicatus* from the Reklaw Formation, but I now believe that was an error, as the specimen can definitely be assigned to the *amoenus* group as here discussed, so should be named *T. amoenus*. In the Gosport Sand Formation, the columellar plaits become much more numerous and finer than those from earlier formations. *Terebrifusus megahani* has only been found in the Cook Mountain Formation and is easily distinguished from the other Gulf Coast species by the strong nodular spiral lines; a similar species is ?*Terebrifusus lepus* Olsson, 1930 of Eocene age from Peru that has 5 nodular spiral lines, although weaker than in *T. megahani*, and an excavated subsutural area. Olsson only doubtfully assigned the species to *Terebrifusus*, because the holotype is much obscured by matrix, but the paratype shows the surface sculpture well and so I believe can be confidently assigned to *Terebrifusus*. The *T. amoenus* group from the Cook Mountain Formation could perhaps be separated from the similar Gosport Sand Formation group as differences do appear to be significant, but without more Gosport Sand specimens to examine that is not done here.

Family Turridae H. Adams & A. Adams,
1853

Genus *Orthosurcula* Casey, 1904

Type species.—*Pleurotoma longiforma* Aldrich, 1897, by subsequent designation (Gardner, 1935)

Orthosurcula ethani, new species
Fig. 2D, E

ZooBank LSID.—urn:lsid:zoobank.org:
act:2B463016-F97D-4033-9FC5-79C5A
8760793

Material examined.—One specimen, holotype, NPL 93890, from locality BEG 21-T-1.

Diagnosis.—Slender *Orthosurcula* species, spire angle of ca. 20°; proportionally large protoconch; apex of anal sinus just anterior to maximum whorl diameter.

Description.—Shell elongate, very small, of 8 whorls; protoconch of 3½ smooth inflated whorls, followed by ¼ whorl or arcuate ribblets, transition to teleoconch abrupt; suture impressed, whorls with subsutural swelling and concave shoulder slope, maximum diameter in lower third of the whorl; surface polished with almost inconspicuous spiral threads covering the whorl and 1–3 larger spiral lines anterior to carina, body whorl with spiral lines to end of the canal; aperture ovate, columella smooth concave; anterior canal unnotched, medium-sized, bent to left and a moderately twisted.

Etymology.—This species is named in honor of Mr. Megahan's grandson Ethan, for his help in collecting.

Remarks.—*Orthosurcula ethani* appears to be the ancestor of *Orthosurcula longiforma* (Aldrich, 1897) from the Oligocene Red Bluff Formation of Mississippi, the type species of *Orthosurcula*. Although this specimen appears to be a juvenile, it can be distinguished from *O. longiforma* by a protoconch of one more whorl, a swollen subsutural collar, a more bent canal, and the more anterior position of the sinus. Axial sculpture is absent, except where some of the growth lines cut into the subsutural collar forming weak nodes there. Of Paleocene age, *Orthosurcula persa* (Whitfield, 1865), most closely approaches this *O. ethani*, with the sinus in a similar position, a weakly swollen collar, and axial sculpture obsolescent on later whorls. MacNeil & Dockery (1984) and Otuka (1959) both treat *Orthosurcula* as a subgenus of *Turricula*, Schumacher, 1817, whereas Palmer & Brann (1966), Harris (1937), Powell (1966), Gardner (1935), Garvie (2013, 2021) all give *Orthosurcula*

full generic rank. *Orthosurcula*, or a genus very close to it, seems to have survived until Recent times as Otuka (1959) lists four species of *Turricula* (*Orthosurcula*) from Japan, two Recent, and two from Neogene rocks, so that the distinguishing characteristics of the genus are recognizable during the entire Cenozoic, thus prompting its treatment as a full genus.

Family Cancellariidae Forbes & Hanley,
1851

Genus *Unitas* Palmer, 1947, in Harris &
Palmer, 1946–1947

Type species.—*Cancellaria costulata* Lamarck, 1803, by original designation.

Unitas duomillias, new species
Fig. 3A, B

ZooBank LSID.—urn:lsid:zoobank.org:
act:E55A418F-4846-4525-9638-8ADC38
E896C4

Material examined.—Two specimens, holotype, NPL 93892, paratype, NPL 93893, both from locality BEG 143-T-83.

Diagnosis.—Elongate *Unitas* species, with aperture at ca. 46% of height, whorls with prominent axial folds, whorls with close-set inconspicuous spiral striae.

Description.—Shell elongate, robust; whorls 5–6, protoconch of two whorls, mammilate, smooth, the nucleus minute, below the first whorl; transition to teleoconch sculpture within 1/8 of a whorl; teleoconch whorls inflated with 9–10 strong, slightly prosocline axial folds, some almost varix-like; surface polished, covered by numerous close-set spiral lines 3 or 4 of which are slightly more prominent and cause weak nodes on the crests of the axials; aperture elongate, outer lip thickened, with 9 or 10 strong lirae, 1 parietal fold and 3 columella folds, the lowest defining the start of a short canal; siphonal fasciole present, columella callus forming a well-defined edge over the last whorl.

Etymology.—The name *duo* (Latin, two), *millias* (Latin, miles) refers to Two Mile Creek, where the specimens were found.

Remarks.—Two similar species are *Unitas euani* Garvie, 2021 and *Unitas anderseni* Schnetler & Petit, 2006, both of Danian, early Paleocene age. *Unitas duomillias* is primarily distinguished from *U. euani* and *U. anderseni* by the more prominent and numerous axial folds. The genus is known from the Upper Eocene Moodys Branch Formation of Mississippi (cf. Robinson 1983, fig. 2a, b), in which the axial folds are more numerous and the spiral lines much more prominent. This is the first record of the genus in the U.S.A. lower or middle Eocene strata of the Gulf or Atlantic coastal plains. The genus is well represented in Eocene localities in the Paris Basin with a somewhat morphologically similar species, albeit with spiral lines, being *Unitas parnensis* (Cossmann, 1896) of middle Eocene (Lutetian) age.

Family Ringiculidae Philippi, 1853
Genus *Ringicula* Deshayes & Milne-
Edwards, 1838

Type species.—*Auricula ringens* Lamarck, 1804, by subsequent designation (Gray, 1847).

Ringicula taenia, new species
Fig. 3C, D

ZooBank LSID.—urn:lsid:zoobank.org:
act:CB06AD03-8C71-486F-9CB6-1C874A
39D8D4

Material examined.—One specimen, holotype, NPL 93891, from locality BEG 143-T-83.

Diagnosis.—A *Ringicula* species with a stepped whorl profile, whorls with a large posteriorly smooth area, and a single parietal fold.

Description.—Protoconch 2¼ smooth inflated whorls, followed by a prominent inclined axial swelling, and within ½ whorl

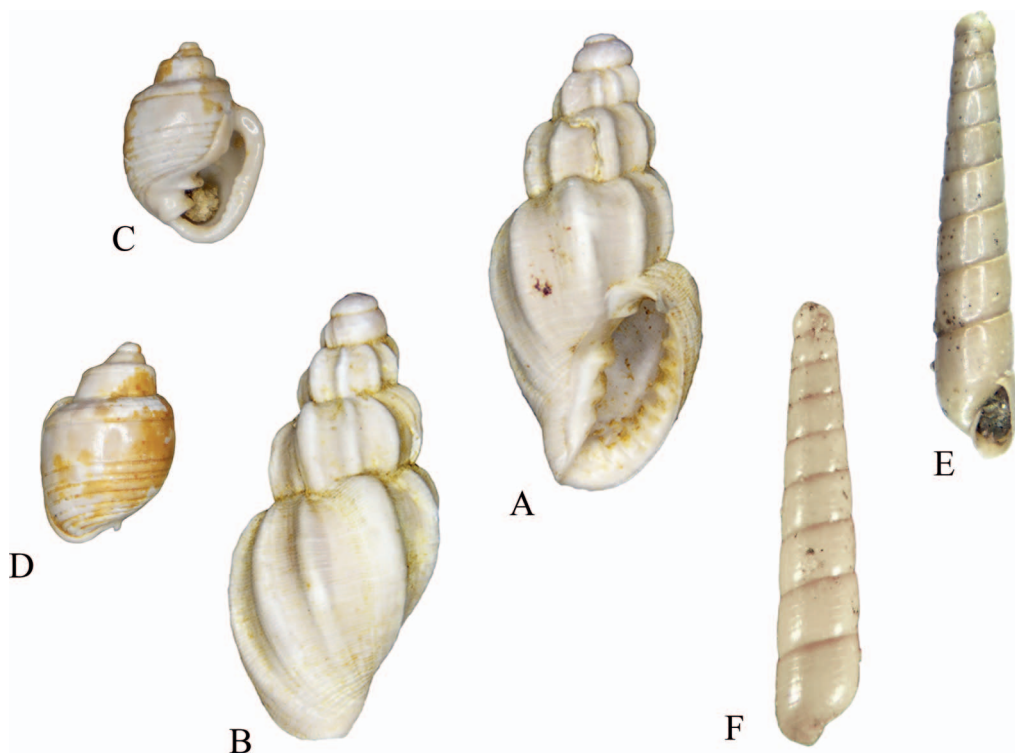


Fig. 3. *Unitas duomillias*. A, apertural, B, dorsal views of holotype, NPL 93892, 7.8 mm height, from locality BEG 143-T-83. *Ringicula taenia*. C, apertural, D, dorsal views of holotype, NPL 93891, 2.6 mm height, from locality BEG 143-T-83. *Syrnela debrae*. E, apertural, F, dorsal views of holotype, NPL 93896, 3.1 mm height, from locality BEG 21-T-1.

transitioning to the adult teleoconch sculpture; suture deeply impressed; whorl profile stepped, swollen subsutural collar, collar margined by a spiral line, 1–2 more developing with age; body whorl with smooth central band, basally with about 9 spiral lines; outer lip with 5 weak denticles; 2 almost horizontal columella plait, parietal callus developed into an inclined blade.

Etymology.—The name *taenia* (Latin, head-band) refers to the smooth area capping the top of the body whorl.

Remarks.—This species is unique with respect to all other *Ringicula* species known from Paleogene strata of the Gulf Coast, as regards the prominent shoulder and the rectangular outline of the outer lip. A wide band devoid of spiral lines below

the shoulder is also a feature of *Ringicula trapaquara deussenii* Gardner, 1927, but that species lacks the shoulder seen on this species. There is an undescribed species (NPL 93903) from the Cane River Formation at Nacogdoches with the same wide band below the shoulder, margined by a strong spiral line, and below that a similar smooth wide band. The affinities of the Nacogdoches species appear to be with *Ringicula biplicata* Lea, 1833, so this new species appears to be a further continuation of the line. *Ringicula taenia* cannot be confidently placed within any of the subgenera of *Ringicula* as listed by Zilch, 1959–1960. It has the spiral sculpture, the thickened, crenate labrum, and the anterior plication defining the base of the columella of *Ringicula* sensu stricto but

not the high spire of that genus, whereas it has the weakly defined anterior notch, the anteriorly constricted, notched aperture of *Ringiculina* Monterosato, 1884 but is lacking the smooth labrum of that taxon. *Ringicula taenia* probably deserves to be placed in a new subgenus of *Ringicula* but with only one specimen available that is not done here.

Family Pyramidellidae Gray, 1840
Genus *Syrnola* Adams, 1860

Type species.—*Syrnola gracillima* A. Adams, 1860 by monotypy.

Syrnola debrae, new species
Fig. 3E, F

ZooBank LSID.—urn:lsid:zoobank.org:act:0784C075-B31F-49B2-9779-0985AEC13563

Material examined.—Two specimens, holotype, NPL 93896, paratype, NPL 93897, from locality BEG 21-T-1.

Diagnosis.—Small *Syrnola* species with columellar plait just anterior to the parietal area, punctate spiral striae and a sutural angle with respect to the shell axis of ca. 18°.

Description.—Protoconch of 2 whorls, immersed to the level of the first whorl, set at an angle of slightly more than 90° to the shell axis; teleoconch of 7–8 whorls, whorls flat, weakly constricted toward the lower suture; suture impressed; surface smooth, shining with 4–6 widely spaced spiral striae, only visible under magnification and seen to be minutely but irregularly punctate; aperture lenticular, basally weakly extended to a point, one adapical duplex fold; outer lip smooth within.

Etymology.—The name *debrae* honors Mr. Megahani's wife, Debra Lynn Megahan.

Remarks.—Robba (2013) is followed for the systematics and separation of pyramidelloidean taxa, where *Syrnola* is given generic rank. Four species of *Pyramidella*

(*Syrnola*) are listed in Palmer & Brann (1966), there treated as subgenera, but none show much similarity to this species. All are much larger, with flatter whorls, and no spiral striations. A much more similar species is *Syrnola pirum* Garvie, 1996 from the Reklaw Formation, but it can be separated again by the lack of spiral striae, and the columella plait is in a much more anterior position in the aperture. A Cook Mountain Formation species with similarly fine spiral striations is *Pyramidella pseudopygmaea* Palmer, 1937, but in this species the striae are very close-set, are not punctate, and the species is much larger in size. Another notable characteristic of *Syrnola debrae* is the angle of the suture with respect to the shell axis (i.e., the line between successive whorls), which is quite oblique at about 65°, whereas in all other Claibornian pyramidelloidean taxa examined the angle is about 80°. Palmer (1937:77) noted *P. pseudopygmaea* occurs in the lower Eocene, Claiborne strata in Texas. All specimens from Texas examined by the author have proved to be this new species not *P. pseudopygmaea* whose occurrence is otherwise from the Gosport Sand Formation in Alabama.

Literature Cited

- Adams, A. 1860. On some new genera and species of Mollusca from Japan. *Annals & Magazine of Natural History* (series 3) 5:405–413.
- Adams, H., & A. Adams. 1853–1858. The genera of recent Mollusca; arranged according to their organization. Volume 1, parts 1–8: 1–256, pls. 1–32 (1853). John van Voorst, London.
- Aldrich, T. H. 1897. Notes on Eocene Mollusca, with descriptions of some new species. *Bulletins of American Paleontology* 2(8):1–26.
- Berry, S. S. 1910. Report on a collection of shells from Peru, with a summary of the littoral marine Mollusca of the Peruvian Zoological Province. *The Nautilus* 23(10):130–132.
- Bouchet, P., & A. Warén. 1986. Revision of the Northeast Atlantic bathyal and abyssal Aclididae, Eulimidae, Epitoniidae (Mollusca, Gastropoda). *Società Italiana malacologia, Bollettino Malacologico, Supplemento* 2:299–576.

- Boury, E. de 1887. Description de Scalidae nouveaux des couches Eocènes du Bassin de Paris, et revision de quelques espèces mal connues. Privately published, 56 pp.
- Boury E. de. 1890. Étude critique des Scalidae miocènes et pliocènes de l'Italie. *Bullettino della Società Malacologica Italiana* 15:161–326.
- Boury, E. de 1911. Etude sur les sous-genres de *Scalidae*, vivants et fossiles II–III. *Journal de Conchyliologie* 58:212–220.
- Casey, T. L. 1904. Notes on the Pleurotomidae with description of some new genera and species. *Transactions of the Academy of Science of St. Louis* 14(5):123–170.
- Conrad, T. A. 1830. On the geology and organic remains of a part of the peninsula of Maryland. Appendix: containing descriptions of twenty-nine new species of fossil shells, noticed in the preceding paper [Pp. 217–230]. *Journal of the Academy of Natural Sciences of Philadelphia*, first series 6:205–230, pls. 9–10.
- Conrad, T. A. 1832–1835. Fossil shells of the Tertiary formations of North America, illustrated by figures drawn on stone, from nature. Vol. 1, Part 4:39–46 (1833).
- Conrad, T. A. 1865. Catalogue of the Eocene and Oligocene Testacea of the United States. *American Journal of Conchology* 1(1):1–35. [Corrections pp. 190+]
- Conrad, T. A. 1868 [1867]. Descriptions of new genera and species of Miocene shells, with notes on other fossil and recent species. *American Journal of Conchology* 3(4):257–270, pls. 19–24.
- Cooke, W. 1926. New Eocene mollusks from Jackson, Miss. *Journal of the Washington Academy of Sciences* 16(5):132–138, 1 pl.
- Cossmann, A. E. M. 1895–1925. *Essais de paléonchologie comparée*. The author and de Rudeval, Paris. *Livrasion* 2:179 pp, 8 pls. (1896); *Livrasion* 7:261 pp, 14 pls. (1906).
- Cox, L. R. 1960. Gastropoda. General characteristics of Gastropoda. Pp. 184–1169 in R. C. Moore, ed., *Treatise on Invertebrate Paleontology*, Part I, Mollusca 1, Mollusca—General Features. University of Kansas Press and The Geological Society of America, Lawrence, Kansas, xxviii + 351 pp.
- Cuvier, G. 1795. Second mémoire sur l'organisation et les rapports des animaux à sang blanc, dans lequel on traite de la structure des Mollusques et de leur division en ordre, lu à la société d'Histoire naturelle de Paris, le 11 prairial, an troisième. *Magazin Encyclopédique, ou Journal des Sciences, des Lettres et des Arts* 2:433–449.
- Deshayes, G. P. 1856–1865. 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. 2:1–968, pls. 1–62 (1861–1864). Baillièere, Paris.
- Deshayes, G. P., & H. Milne-Edwards. 1838. Histoire naturelle des animaux sans vertèbres, présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent, par J. B. P. A. de Lamarck. 2nd Edition. Vol. 8, Mollusques. J. B. Baillièere, Paris, 660 pp.
- Dockery, D. T., III. 1977. Mollusca of the Moodys Branch Formation, Mississippi. *Mississippi Geological, Economic and Topographical Survey, Bulletin* 120:1–212, 27 pls.
- Fisher, W. L., P. U. Rodda, & J. W. Dietrich. 1964. Evolution of *Athleta petrosa* stock (Eocene, Gastropoda) of Texas. The University of Texas Publication 6413:1–117, 4 pls.
- Folin, L. de. 1867. Les méléagrnicoles. Espèces nouvelles. *Recueil des Publications de la Société Havraise d'Études Diverses* 33:41–112, 6 pls.
- Forbes, E., & S. Hanley. 1850–1853. A history of British Mollusca and their shells. J. Van Voorst, London, 320 pp.
- Gardner, J. 1927. New species of mollusks from the Eocene of Texas. *Journal of the Washington Academy of Sciences* 17(14):362–383, figs. 1–44.
- Gardner, J. 1935. The Midway group of Texas; including a chapter on the coral fauna by T. Wayland Vaughan and Willis Parkinson Popenoe. *The University of Texas Bulletin* 3301:1–403, 28 pls.
- Garvie, C. L. 1996. The molluscan macrofauna of the Reklaw Formation, Marquez Member (Eocene: Lower Claibornian), in Texas. *Bulletins of American Paleontology* 111(352):1–177, 23 pls.
- Garvie, C. L. 2013. Studies on the molluscan paleomacrofauna of the Texas Paleogene. *Bulletins of American Paleontology* 384–386:216 pp, 22 pls.
- Garvie, C. L. 2021. The macrofauna of the Tehuacana Limestone Member (Danian, Kincaid Formation) of central Texas, with the description of a few new taxa from the Pisgah Member. *Bulletins of American Paleontology* 399–400:1–292, 21 pls.
- Gray, J. E. 1840. Synopsis of the contents of the British Museum. 42nd edition. British Museum. G. Woodfall, London, 370 pp.

- Gray, J. E. 1847. List of the genera of recent Mollusca, their synonyma and types. Proceedings of the Zoological Society of London 15:129–219.
- Gray, J. E. 1853. On the division of ctenobranchous gastropodous Mollusca into larger groups and families. The Annals and Magazine of Natural History, Ser. 2, 11(6):124–132.
- Harris, G. D. 1937. Turrid illustrations, mainly Claibornian. *Palaeontographica Americana* 2(7):1–94, 14 pls.
- Harris, G. D., & K. V. W. Palmer. 1946–1947. The Mollusca of the Jackson Eocene of the Mississippi embayment (Sabine River to the Alabama River). *Bulletins of American Paleontology* 30(117):1–564, 65 pls. [Part I. Bivalves and bibliography for parts I and II. Harris, G. D., 1946, 206 pp. Part II. Univalves and index. Palmer, K. V. W., 1947, pp. 207–563, pls. 26–56, 62–64; pls. 57–61 by G. D. Harris].
- Jeffreys, J. G. 1877. XXXII.—New and peculiar Mollusca of the *Eulimidae* and other families of Gastropoda, as well as of the Pteropoda, procured in the ‘Valorus’ Expedition. The Annals and Magazine of Natural History, Series 4, 19(112):317–339.
- Johnson, C. W. 1899. New and interesting species in the “Isaac Lea Collection of Eocene Mollusca.” Proceedings of the Academy of Natural Sciences of Philadelphia 51:71–82
- Lamarck, J. B. P. A., M. de. 1802–1806. Mémoires sur les fossiles des environs de Paris, comprenant la détermination des espèces qui appartiennent aux animaux marins sans vertèbres, et dont la plupart sans figures dans la collection des vélins du muséum. *Annales du Muséum national d’Histoire Naturelle* 2:57–64, 163–169, 217–227, 315–321, 385–391 (1803); 5:28–36, 91–98, 179–188, 237–245, 349–357 (1804).
- Lea, H. C. 1841. IX.—Description of some new species of fossil shells, from the Eocene, at Claiborne, Alabama. The American Journal of Science and Arts 40:92–103.
- Lea, I. 1833. Contributions to geology. Carey, Lea & Blanchard, Philadelphia, 227 pp., 6 pls.
- Lozouet, P. 1999. Nouvelles espèces de gastéropodes (Mollusca: Gastropoda) de L’Oligocène et du Miocène inférieur d’Aquitaine (Sud-Ouest de la France). Partie 2. *Cossmanniana* 6(1–2):1–68.
- MacNeil, F. S., & D. T. & Dockery, III. 1984. Lower Oligocene Gastropoda, Scaphopoda, and Cephalopoda of the Vicksburg Group in Mississippi. Mississippi Department of Natural Resources, Bureau of Geology, Bulletin 124:1–415, 72 pls.
- Meyer, O. 1887. Beitrag zur Kenntnis der Fauna des Alttertiärs von Mississippi und Alabama. Bericht über die Senckenbergische naturforschende Gesellschaft 1887:3–22, 2 pls.
- Monterosato, T. A. di 1884. Nomenclatura generica e specifica di alcune conchiglie mediterranee. Virzi, Palermo, 152 pp.
- Olsson, A. A. 1930. Contributions to the Tertiary paleontology of northern Peru: Part 3, Eocene Mollusca. *Bulletins of American Paleontology* 17(62):1–96, pls. 1–12.
- Otuka, Y. 1959. Japanese species of *Orthosurcula*. *Venus* 20(3):245–248.
- Palmer, K. V. W. 1937. The Claibornian Scaphopoda, Gastropoda and dibranchiate Cephalopoda of the southern United States. *Bulletins of American Paleontology* 7(32):730 pp., 90 pls.
- Palmer, K. V. W., & D. C. Brann. 1966. Catalogue of the Paleocene and Eocene Mollusca of the southern and eastern United States. Part II, Gastropoda. *Bulletins of American Paleontology* 48(212):471–1054, pls. 4, 5.
- Philippi, R. A. 1853. *Handbuch der Conchyliologie und malacozoologie*. Eduard Anton, Halle, xx + 547 pp.
- Powell, A. W. B. 1966. The Molluscan families Speightiidae and Turridae: an evaluation of the valid taxa, both Recent and fossil, with lists of characteristic species. *Bulletin of the Auckland Institute and Museum* 5:1–184, 23 pls.
- Rafinesque, C. S. 1815. *Analyse de la nature, ou tableau de l’univers et des corps organisés*. Palermo, 224 pp.
- Risso, A. 1826. *Histoire naturelle des principales productions de l’Europe meridionale et particulièrement de celles des environs de Nice et des Alpes maritimes*. Tome 4. F.-G. Levrault, Paris, 439 pp., 12 pls.
- Robba, E. 2013. Tertiary and Quaternary fossil pyramidelloidean gastropods of Indonesia. *Scripta Geologica* 144:1–191, 25 pls.
- Robinson, J. E. 1983. New and interesting Eocene molluscan species from the Moodys Branch Formation. *Mississippi Geology* 3(3):9–12.
- Schnetler, K. I., & R. E. Petit. 2006. Revision of the gastropod family Cancellariidae from the Danian (Early Paleocene) of Fakse, Denmark. *Cainozoic Research* 4(1–2):97–108.
- Schumacher, C. F. 1817. *Essai d’un nouveau système des habitations des vers testacés, avec XXII planches*. Schultz, Copenhagen, 287 pp., 22 pls.
- Scott, A. J. 1963. *Interpretation of Eocene Depositional Environments, Little Brazos River Valley, Texas*. Tertiary field trip guidebook. Baylor Geological Society, Baylor University, Waco, Texas, and University of Texas Geo-

- logical Society, Austin, Texas, 29 pp, illustrations.
- Snyder, M. A. 2002. *Conradconfusus*, a replacement name for *Buccinofusus* Conrad, 1868, non 1866 (Mollusca, Gastropoda). *Cainozoic Research* 1(1–2):129–132.
- Sowerby, G. B. 1844. Descriptions of new species of *Scalaria*, collected by Mr. H. Cumming, to be figured in the fourth part of *Thesaurus Conchyliorum*. *Proceedings of the Zoological Society of London* 12:10–14.
- Stenzel, H. B. 1938. *The Geology of Leon County, Texas*. The University of Texas Publication 3818:1–295.
- Stenzel, H. B., E. K. Krause, & J. T. Twining. 1957. Pelecypoda from the Type Locality of the Stone City Beds (Middle Eocene) of Texas. *The University of Texas Publication* 5704:1–237.
- Verrill, A. E. 1882. Catalogue of marine Mollusca added to the fauna of the New England region, during the past ten years. *Transactions of the Connecticut Academy of Arts and Sciences* 5(2):447–588, pls. 42–44, 57–58.
- Wenz, W. 1938–1944. Teil 1: Allgemeiner Teil und Prosobranchia. Teil 1, Lief. 1:1–240 (1938); Teil 7, Lief. 9:1507–1639 (1944). In O. H. Schindewolf, ed., *Handbuch der Paläozoologie*, Band 6, Gastropoda. Borntraeger, Berlin.
- Whitfield, R. P. 1865. Descriptions of new species of Eocene fossils. *American Journal of Conchology* 1(3):259–268, pl. 27.
- Zilch, A. 1959–1960. Teil 2: Euthyneura. In O. H. Schindewolf, ed., *Handbuch der Paläozoologie*, Band 6, Gastropoda. Borntraeger, Berlin, xii + 834 pp.