

FORAMINIFERA OF THE GENUS SIPHONINA AND RELATED GENERA

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In 1850 Reuss erected the genus *Siphonina* and for its genotype described the species *S. fimbriata* Reuss from the Miocene of Austria. *Siphonina* is a genus related to *Epistomina* and others of the Rotaliidae. Most of the recent and fossil specimens have been referred by authors to the type species described by Reuss or to that of Czjzek. Brady in the *Challenger* Report placed Reuss' and Czjzek's species under the genus *Truncatulina*. For *Truncatulina* the older generic name of *Cibicides* given by Montfort must be used. In that genus the aperture comes over onto the dorsal side of the test which is usually attached. The specimens referred to *Siphonina* obviously can not be placed under *Truncatulina* or *Cibicides*. Reuss' genus *Siphonina* is not only well described and the type species of the Miocene of the Vienna Basin well known but the characters are well fixed and of generic importance. *Siphonina* has been recognized by later authors and its position is worthy of full recognition not alone on the basis of nomenclatorial rules but because of its structural characters.

In America the earliest known appearance of the genus is in the Upper Cretaceous from which a species has been recorded by Mrs. Plummer as *Siphonina prima* Plummer. This species has decidedly primitive characters. Like the species of the Midway and Wilcox Eocene, it is small and inconspicuous with the neck only slightly developed. In the Claiborne and Jackson Eocene of America the species are larger, and specimens often very abundant. Oligocene, Miocene, and Pliocene species continued the specialization and highly ornamented species occur. In the present oceans specimens are most abundant in the West Indian region and particularly the Indo-Pacific.

In the Claiborne Eocene of the United States there was developed a tendency to uncoil in the genus *Siphoninella* and another species is living in the West Indian region.

The globular forms referred to *Siphoninoides* need additional study to reveal their full characters. Specimens are rare, however, and sections have not been fully studied as they deserve to be.

That there are many distinct species will be seen by a study of the accompanying plates. The species have definite stratigraphic and geographic distributions as will be indicated.

Genus SIPHONINA Reuss, 1850

Siphonina REUSS (Type *S. fimbriata* Reuss), Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 372.—TERQUEM, Mém. Soc. Géol. France, ser. 3, vol. 2, 1882, p. 84.—CUSHMAN, Smithsonian Misc. Coll., vol. 77, No. 4, 1925, p. 45; Contrib. Cushman Lab. Foram. Res., vol. 3, pt. 1, 1927, p. 77.

Truncatulina (part) of various authors.

Test free, trochoid, composed of numerous chambers arranged in a somewhat irregular spiral, usually biconvex; wall calcareous, perforate, the periphery often carinate and the carina fimbriate in some species; aperture in the adult just below the periphery on the ventral side, elliptical with usually a short neck and often a phialine lip.

SPECIES FROM THE UPPER CRETACEOUS

SIPHONINA PRIMA Plummer

Plate 2, figs. 4 a-c

Siphonina prima PLUMMER, Univ. Texas Bull. 2644, 1927, p. 148, pl. 12, figs. 4 a-c.

Test small, nearly circular, about equally biconvex but much compressed, periphery angled, sharply acute and delicately serrate, very slightly lobate; chambers usually five in the last-formed volution, very slightly inflated on the ventral side; sutures distinct, obliquely curved, marked by the serrate edges of the chambers of the dorsal side, not depressed; on the ventral side, more nearly radial, very slightly curved, somewhat depressed; wall smooth, distinctly and somewhat coarsely perforate, aperture a small, narrowly elliptical opening on the ventral side close to the periphery, the elongate axis in the axis of coiling without a definite neck.

Diameter up to 0.25 mm.; thickness 0.12 mm.

The types of this species are from the Midway Eocene of Texas where it is fairly common. To Mrs. Plummer I am indebted for the opportunity of studying material from the type locality. Mrs. Plummer has also recorded the species from the Upper Cretaceous, Ripley formation of Owl Creek, Mississippi, as well as at one locality in the topmost Navarro clays of Texas. Like many other genera which originated in the uppermost Cretaceous, the main development is in the Eocene. Mrs. Plummer also records its occurrence in

the London clay of Southern England as well as at numerous localities in the Midway of Texas.

Siphonina prima Plummer represents the simple type of the genus from which the later more highly developed species have come.

SPECIES FROM THE EOCENE

SIPHONINA WILCOXENSIS, new species

Plate 2, figs. 1-3

Test small, nearly circular, biconvex but slightly more inflated on the ventral side, compressed, periphery angled, sharply acute and delicately serrate, slightly lobulate; chambers usually six in the last-formed volution, slightly inflated on the ventral side; sutures somewhat indistinct on the dorsal side, strongly oblique, slightly curved, somewhat marked by the serrate edges of the chambers, not depressed, on the ventral side very nearly radial, distinctly depressed; wall smooth, distinctly and coarsely perforate; aperture a small, elliptical opening on the ventral side close to the periphery, with a distinct lip but with the neck only slightly developed or wanting.

Diameter up to 0.30 mm.; thickness 0.16 mm.

Holotype.—(Cat. No. 369616 U.S.N.M.), from the Wilcox Eocene, Nanafalia formation, upper portion of Nanafalia Bluff, Tombigbee River, Ala. Similar specimens also occur in the Tuscahoma formation, Bells Landing, Alabama River, Ala., and Tuscahoma Landing, base of bluff, Tombigbee River, Ala. Less well marked specimens occur in the Hatchetigbee formation, McKay's marl bed, Souwashee Creek, 2 miles south of Meridian, Lauderdale County, Miss.

This species seems to be a derivative from the older *Siphonina prima* Plummer from which it differs in the somewhat larger size, more convex ventral side, more numerous and narrower chambers, and more strongly developed apertural characters.

SIPHONINA LAMARCKANA, new species

Plate 3, fig. 3

Test small, nearly circular, biconvex but more inflated on the ventral side, somewhat compressed, periphery angled, sharply acute and delicately serrate, slightly lobulate; chambers four in the last-formed volution, inflated on the ventral side; sutures very distinct, strongly oblique and curved on the dorsal side, slightly marked by the serrate edges of preceding chambers, not depressed, on the ventral side nearly radial, depressed; wall smooth with a few distinct scattered larger perforations in addition to the usual fine ones, aperture a comparatively large, broadly elliptical opening on

the ventral side close to the periphery with a distinct lip and short neck.

Diameter, 0.40 mm.; thickness, 0.22 mm.

Holotype.—(Cushman Coll. No. 6725) from the interior matrix of a *Cerithium giganteum* from the Eocene, Calcaire grossier of Grignon, France.

It may be noted here that Terquem figures a species of *Siphonina* from the Eocene of the Paris Basin.¹ The measurements given are somewhat larger than our type. The figures given by Terquem are very evidently patterned after the type figures of Reuss but are reversed in drawing.

In Paris, through the kindness of Dr. G. Dollfus, I was enabled to examine the specimen figured by Terquem. It is a much smoother form than the figure indicates, and is not at all well drawn, a criticism that will apply to most of Terquem's figures with which I compared the original specimens.

In this Middle Eocene species there is an advance in the greater development of the apertural characters over those of the lower Eocene.

SIPHONINA HOWEI, new species

Plate 3, figs. 6 a-c

Test small, nearly circular, nearly equally biconvex, much compressed, periphery angled, sharply acute and with a distinctly serrate keel, lobulate, chambers usually six in the last-formed volution, the last few very slightly inflated on both sides; sutures distinct, depressed, slightly limbate, very slightly curved; wall distinctly spinose with short blunt spines and the periphery very serrate; aperture broadly elliptical, occupying nearly the whole height of the last-formed chamber, with a distinctly thickened lip and short neck.

Diameter, 0.30 mm.; thickness, 0.10 mm.

Holotype.—(Cushman Coll. 6726) from Lower Claiborne, Cane River formation at Natchitoches, Louisiana. The species is named for Dr. Henry V. Howe, who has done so much work on the paleontology of Louisiana.

This species is easily distinguished by its high degree of ornamentation and much compressed test.

SIPHONINA CLAIBORNENSIS, new species

Plate 3, figs. 5 a-c

Test small, nearly circular, nearly equally biconvex, somewhat compressed, periphery angled, sharply acute, with a very slightly developed keel, lobulate; chambers usually five in the last-formed volu-

¹ Mém. Géol. Soc. France, ser. 3, vol. 2, 1882, p. 84, pl. 8 (16), fig. 16 a-c.

tion, slightly inflated on the ventral side; sutures distinct, strongly oblique, slightly curved, somewhat limbate on the dorsal side, on the ventral side nearly radial, depressed; wall smooth, very distinctly perforate; aperture elongate, narrowly elliptical, occupying the whole height of the chamber, with a distinct lip but no definite neck.

Diameter 0.35 mm.; thickness 0.15 mm.

Holotype.—(Cat. No. 369617, U.S.N.M.) from the Claiborne, Lisbon formation, 1 mile north of Washitubbee Station, N. O. and N. E. Railroad, Clarke County, Miss., collected by E. N. Lowe and C. Wythe Cooke.

It also occurs in the Lisbon formation at bridge over Falling Creek, 6 miles south of Quitman, Clarke County, Miss., and cut on Alabama and Vicksburg Railroad, $3\frac{1}{4}$ miles east of Newton, Newton County, Miss., and south bank of Tombigbee River at bend in river $\frac{3}{4}$ mile below Lock No. 1 and about 1 mile above St. Stephens Bluff, Washington County, Ala.

This is a very much smoother species than the preceding with a very slight development of the keel. It is a forerunner of such species as *Siphonina jacksonensis* Cushman and Applin.

SIPHONINA JACKSONENSIS Cushman and Applin

Plate 1, figs. 6 a-c

Siphonina jacksonensis CUSHMAN and APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 10, 1926, p. 180, pl. 9, figs. 20-23.

Test of medium size for the genus, nearly circular, nearly equally biconvex, much compressed, periphery angled, sharply acute, delicately serrate, lobulate; chambers usually five in the last-formed coil, the last ones inflated somewhat on both sides; sutures slightly depressed, oblique and curved on the dorsal side, nearly radial below, the umbilical region with clear shell material; wall slightly spinose throughout; aperture narrowly elliptical, nearly the whole height of the chamber, with a distinctly thickened lip but no definite neck.

Diameter up to 0.55 mm.; thickness 0.18 mm.

This species was originally described from the Jackson Eocene, 4 miles east of Diboll, Angelina County, Tex. It has proved to be a common species now known from the Upper Eocene of Louisiana, Mississippi, Alabama, and North Carolina. It also occurs in the Alazan clay of Mexico collected by Dr. T. Wayland Vaughan on Rio Tuxpan, 200 meters above the mouth of the Rio Pantepec, Vera Cruz, Mexico.

SIPHONINA JACKSONENSIS Cushman and Applin, var. LIMBOSA Cushman, new variety

Plate 4, fig. 2

Tests differing from the typical in the very limbate sutures and finer perforations of the wall.

Holotype of variety.—(Cat. No. 369618), U.S.N.M., from type locality of the Alazan clay, on Rio Buena Vista, Vera Cruz, Mexico, collected by Dr. T. Wayland Vaughan.

SIPHONINA ADVENA Cushman, var. EOCENICA Cushman and Applin

Plate 4, fig. 3

Siphonina advena CUSHMAN, var. *eocenica* CUSHMAN and APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 10, 1926, p. 180, pl. 9, figs. 16-19.

This variety differs from the typical form in the less prominent spiral suture on the dorsal side and the more nearly entire periphery; the chambers not showing as definitely as in the typical.

Diameter 0.40 mm.; thickness 0.22 mm.

The types of this variety are from the Jackson Eocene of Tar Kiln Creek, ½ mile above Neches River, Trinity County, Tex.

This variety is well distributed in the Upper Eocene of the Gulf Coastal Plain of the United States and occurs in the Alazan of Mexico in material collected by Dr. T. Wayland Vaughan on Rio Tuxpan, 200 meters above the mouth of the Rio Pantepec, Vera Cruz, Mexico.

SIPHONINA TENUICARINATA Cushman

Plate 4, fig. 1

Siphonina tenuicarinata CUSHMAN, Journ. Pal., vol. 1, 1927, p. 166, pl. 26, figs. 11, 12.

Test nearly equally biconvex, periphery very acute and with a broad thin carina, the edge entire except where broken accidentally; chambers usually five in the last-formed volution, only slightly inflated on the ventral side; sutures on the dorsal side not very distinct, especially those of the earlier volutions, on the ventral side nearly radial, slightly depressed; wall smooth but distinctly perforate; aperture elongate elliptical with a wide lip and short neck.

Diameter 0.60 mm.; thickness 0.30 mm. or more.

Holotype.—(Cat. No. 369309 U.S.N.M.) from the typical Alazan on the Rio Buena Vista just south of crossing of Alazan to Moyutla road, collected by Dr. T. Wayland Vaughan, who also collected it at several other stations in the Alazan of Mexico. The figured specimen which has the keel less developed is from the *Ditrupa*-bed of Trinidad where the species is also well developed.

In some of the Mexican material the carina becomes very wide and is more or less wrinkled, giving it the appearance of being costate.

SPECIES FROM THE OLIGOCENE

SIPHONINA ADVENA Cushman

Plate 1, figs. 7 a-c

Siphonina advena CUSHMAN, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 98, 137, pl. 22, figs. 1, 2; Prof. Paper 133, 1923, p. 42.

Test biconvex, the ventral side more convex than the dorsal, periphery subacute, with the keel not usually strongly developed; chambers usually five in the last-formed volution; sutures on the dorsal side flush with the surface, somewhat limbate, ventrally nearly radial, but slightly curved, very slightly depressed; wall smooth, very distinctly perforate, the perforations often in lines giving a distinctive appearance to the test; aperture elliptical, with a distinct neck and broad lip.

Diameter 0.50 mm.; thickness 0.20 mm.

This is an abundant species in all the members of the Lower Oligocene, Vicksburg, of the Gulf Coastal Plain of the United States occurring in the Byram calcareous marl, Glendon limestone, Marianna limestone, Mint Spring marl, and Red Bluff clay in Mississippi, Alabama, and Florida. The figured specimen is an especially well-preserved one from the Byram marl.

Specimens apparently of this species were collected by Dr. T. Wayland Vaughan from the Oligocene of Mexico along the Transcontinental Railroad east of Los Naranjos.

SPECIES FROM THE MIOCENE

SIPHONINA RETICULATA (Czjzek)

Plate 1, figs. 1 a-c, 2 a-c; plate 3, figs. 4 a-c

Rotalina reticulata CZJZEK, Haidinger's Nat. Abh., vol. 2, 1848, p. 145, pl. 13, figs. 7-8.

Siphonina reticulata BROWN, Lethaea Geognostica, ed. 3, vol. 3, 1853-1856, p. 227, pl. 35, figs. 23 a-c.

Siphonina fimbriata REUSS, Denkschr. Akad. Wiss. Wien, 1849, p. 372, pl. 47, fig. 6.

Test nearly equally biconvex, somewhat compressed, periphery angled; usually four chambers in the last-formed volution, only slightly inflated; sutures depressed slightly on the ventral side, radial, on the dorsal side curved, strongly marked by the fimbriation of the periphery of the chambers; aperture elliptical, with a distinct lip and well marked, contracted neck.

Diameter 0.50 mm.; thickness 0.25-0.30 mm.

The type species of the genus is *Siphonina fimbriata* Reuss but this is obviously a synonym of the earlier described *S. reticulata*

(Czjzek) both of which are from the Miocene of Austria. Plate 3, Figures 4 *a-c* show a specimen from the Miocene of Kostej in the Banat region of Hungary which has the characters of this species. The much-curved dorsal sutures with the fimbriate border and the well-developed neck are apparent. It is evidently a species widely distributed in the Miocene of central Europe. The synonymy of this species contains many references which evidently should be placed under other species but without seeing the original specimens, it is not always possible to be sure of the exact position of these. Some of the more obvious ones will be noted especially under the living species.

SIPHONINA PULCHRA Cushman

Plate 2, fig. 5

Siphonina pulchra CUSHMAN, Carnegie Inst. Washington, Publ. 291, 1919, p. 42, pl. 14, figs. 7 *a-c*; Publ. 311, 1922, p. 49, pl. 7, figs. 11, 12; Publ. 344, 1926, p. 42.

Siphonina reticulata CUSHMAN (not Czjzek), Carnegie Inst. Washington, Publ. 291, 1919, p. 42.

Test nearly circular, about equally biconvex, periphery subacute or even somewhat rounded, compressed; chambers usually five in the last-formed volution, not inflated; sutures distinct not depressed, limbate; wall smooth, conspicuously perforate; aperture elliptical, with a distinct lip and short well-marked neck.

Diameter up to 0.65 mm.; thickness 0.30 mm.

The types of this species are from the Miocene of the gorge of the Yumuri River, Matanzas, Cuba. The species evidently persists and is now living in the general West Indian Region. It occurred at the Tortugas and also in collections from Porto Rico.

The young stages are much more like *Siphonina fimbriata* (Czjzek) but in the adult the specific characters are taken on making a very different test, the peripheral carina is largely lost and the sutures become more limbate. The species is evidently a derivative from *S. advena* Cushman of the Lower Oligocene and in the deeper waters of the West Indian region is also represented by *S. bradyana* Cushman, new species described on a later page.

SIPHONINA AUSTRALIS, new species

Plate 2, figs. 6 *a-c*; plate 3, figs. 7 *a-c*, 8 *a-c*

Test rounded, biconvex, usually slightly more convex on the ventral side, periphery subacute; chambers usually five in the last-formed volution, slightly inflated ventrally; sutures on the dorsal side limbate, marked by the crenulations of the margin of the earlier chambers, ventral sutures slightly curved, nearly radial, very slightly

depressed; wall very coarsely perforate, peripheral carina also coarsely marked; aperture broadly elliptical with a very distinct thickened lip and prominent neck.

Diameter 0.50 mm.; thickness 0.22 mm.

Holotype.—(Cushman Coll. 6588) from the Balcombian, Lower Beds of Muddy Creek, Victoria, Australia, collected by W. J. Parr. I have material also from the Janjukian Miocene, green marls, Bird Rock Cliffs, Torquay, Victoria, Australia, collected by W. J. Parr and from the Miocene of the Filter Quarry, Batesford, near Geelong, Victoria, Australia, collected by A. C. Collins.

This is evidently the species recorded by Chapman and others from the Miocene of the Australian region. Like many other species of the Australian Tertiary and living Indo-Pacific forms, it shows close relationships with our Oligocene and Miocene species such as *S. advena* and *S. pulchra*. It is perhaps nearer to *S. reticulata* than any other of the species described.

Specimens from the Oligocene of Clifton Bank, near Hamilton, Victoria, Australia, also appear to belong here.

SPECIES FROM THE PLIOCENE

SIPHONINA TUBERCULATA (A. Silvestri)

Plate 3, figs. 1 *a-c*

Truncatulina reticulata (CZJZEK), var. *tuberculata* A. SILVESTRI, Mem. Pont. Accad. Nuovi Lincei, vol. 15, 1898, p. 300, pl. 6, figs. 11 *a-c*.

Test only slightly compressed, nearly equally biconvex, periphery acute, with a distinct, fimbriate carina; chambers indistinct due to the surface ornamentation which consists of numerous rather large tubercles in general following the lines of the sutures; aperture with a distinctly developed neck and slight lip.

Diameter 0.45 mm.; thickness 0.27 mm.

The types of this species are from the Pliocene about Siena, Italy. It is a distinct species.

SIPHONINA PLANOCONVEXA (A. Silvestri)

Plate 3, figs. 2 *a-c*

Truncatulina reticulata (CZJZEK), var. *planoconvexa* A. SILVESTRI, Mem. Pont. Accad. Nuovi Lincei, vol. 15, 1898, p. 300, pl. 6, figs. 12 *a-c*.

Test plano-convex, dorsal side flattened, ventral side strongly convex, periphery acutely angled, with a sharp peripheral carina; chambers with about five making up the last-formed coil, inflated on the ventral side; sutures of the dorsal side flush with the surface, marked by the fimbriate keels of the chambers, on the ventral side

with a high secondary fimbriate keel along the suture; wall coarsely perforate; aperture elliptical, with a distinct contracted neck and thickened lip.

Diameter 0.40 mm.; thickness 0.15 mm.

The types of this species are from the Pliocene of Italy near Siena. I have excellent specimens from the Pliocene of Calabria and have collected it myself from the Pliocene of Coroncina, near Siena, Italy.

This is one of the most striking and most highly ornamented species of the genus, apparently very specialized and becoming extinct in the Pliocene.

LIVING SPECIES

SIPHONINA TUBULOSA Cushman

Plate 1, figs. 3 *a-c*, 5 *a-c*

Truncatulina reticulata H. B. BRADY (not Czjzek), Rep. Voy. *Challenger*, vol. 9, 1884, pl. 96, figs. 5-7 (not fig. 8).

Siphonina tubulosa CUSHMAN, Carnegie Inst. Washington, Publ. 342, 1924, p. 40, pl. 13, figs. 1, 2.

Test biconvex, slightly more convex on the ventral than dorsal side, periphery acute, with a distinct keel, developing into tubules; chambers usually five in the last-formed volution, very slightly inflated on the ventral side; sutures distinct, curved, slightly limbate; wall with the surface often developing distinct tubercles or with large perforations; aperture broadly elliptical with a distinct, contracted neck and phialine lip.

Diameter 0.50 mm.; thickness 0.20 mm.

The types of this species are from Samoa. Brady's figures according to Nuttall are from Bass Strait and from Fiji. The species has a distinctly Indo-Pacific distribution from the records. It may be best distinguished by the distinctly separated tubules of the periphery.

SIPHONINA PHILIPPINENSIS, new species

Plate 4, figs. 4 *a-c*

Test small, unequally biconvex, the ventral side more convex than the dorsal, periphery subacute, with a finely fimbriate keel; chambers usually five in the last-formed volution, not inflated; sutures curved, on the ventral side distinctly limbate and in the last-formed ones somewhat spreading on the surface or forming a secondary ornamentation; wall only slightly roughened along the sutures; aperture elongate elliptical, without a neck.

Diameter 0.30 mm.; thickness 0.15 mm.

Holotype.—(Cat. No. 20311, U.S.N.M.) from *Albatross* Station D5242, lat. 6° 51' 53'' N.; long. 126° 14' 10'' E.; in 215 fathoms off the Philippines.

In some respects, the small size, finely reticulate narrow keel and lack of neck this species most closely resembles the early Eocene species of America. This relationship of the living species of the Philippine region has been noted among many other genera and species of the foraminifera.

SIPHONINA BRADYANA, new species

Plate 1, figs. 4 a-c

Truncatulina reticulata H. B. BRADY (part) (not Čzjzek), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 96, fig. 8.

Test nearly equally biconvex, periphery acute with a broad thin carina somewhat fimbriate, but the fine tubules not reaching to the edge of the keel, the outer half of which is clear; chambers about five in the last-formed volution, not inflated; sutures distinct, limbate, not depressed; wall coarsely perforate, smooth; aperture elliptical, with a broad flaring lip but very short neck.

Diameter 0.60 mm.; thickness 0.28 mm.

Holotype.—(Cat. No. 20309, U.S.N.M.) from *Albatross* Station D2352 in 463 fathoms, Lat. 22° 35' N.; long. 84° 23' W.

Brady figured this species from *Challenger* Station 24 off the West Indies.

It is related to *Siphonina pulchra* Cushman but has developed a very wide keel among other characters. It is apparently limited to the West Indian region.

Genus SIPHONINELLA Cushman, 1927

Siphoninella CUSHMAN, Contrib. Cushman Lab. Foram. Res., vol. 3, pt. 1, 1927, p. 77, pl. 16, fig. 13 (Genotype *Truncatulina soluta* H. B. Brady).

Truncatulina (part) H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 670.

Test in the early stages similar to *Siphonina*, in the later chambers becoming uncoiled, the aperture nearly terminal, slightly on the ventral side, with a neck and lip.

This genus is very evidently the attempt of the close coiled trochoid *Siphonina* to take on an uncoiled habit. The earliest known species occurs in the Claiborne Eocene of Louisiana and the other is now living off the West Indies.

SIPHONINELLA CLAIBORNENSIS Cushman and Howe

Plate 4, figs. 5 a-c

Siphoninella claibornensis CUSHMAN and HOWE, Contrib. Cushman Lab. Foram. Res., vol. 3, pt. 2, 1927, p. 120, pl. 24, figs. 8-10.

Test in the early portion trochoid, unequally biconvex, the ventral side more convex than the dorsal, in later growth uncoiled in the last two chambers; periphery of the earlier portion strongly carinate, the carina divided into tooth-like portions, usually coalescing and typically with an angle in each process, later chambers slightly rounded and without the keel; sutures somewhat limbate, flush on the dorsal side, very slightly depressed on the ventral; wall very coarsely perforate, especially on the dorsal side; apertural end with a distinct lip, a slightly constricted neck and narrow elongate aperture.

Length 0.35 mm.; breadth 0.25 mm.; thickness 0.10 mm.

The types of his species are from the Claiborne Eocene of Louisiana.

SIPHONINELLA SOLUTA (H. B. Brady)

Truncatulina soluta H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 670, pl. 96, figs. 4 a-c.

Siphoninella soluta CUSHMAN, Contrib. Cushman Lab. Foram. Res., vol. 3, pt. 1, 1927, p. 77, pl. 16, fig. 13.

Test with all but the last two or three chambers trochoid, close-coiled, the last ones becoming uncoiled, periphery acute, with a distinct keel, tubulated; wall of the early chambers smooth, later with a few blunt spines with a row of spines along the sutures; aperture narrowly elliptical with a short constricted neck and distinct lip.

Length 0.38 mm.; breadth 0.25 mm.; thickness 0.10 mm.

The types of this species were from *Challenger* Station 24 off the West Indies.

In all its characters, this is a very distinct species from that of the Claiborne Eocene of Louisiana.

Genus SIPHONINOIDES Cushman, 1927

Siphoninoides CUSHMAN, Contrib. Cushman Lab. Foram. Res., vol. 3, pt. 1, 1927, p. 77, pl. 16, fig. 15 (genotype *Truncatulina echinata* H. B. Brady).

Truncatulina H. B. Brady (part) Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 670, pl. 96, figs. 9-14.

Test globular, irregularly trochoid; wall calcareous, perforate; aperture generally circular with a short neck and flaring lip.

The species of this genus are known only from the Tertiary and Recent. In some of the characters, the genus resembles *Siphonina*, and in others *Sphaeroidina*. A study should be made of the very

early stages as well as of sections of the test to determine the development especially in the microspheric form. Material has not yet been available in sufficient amount for this work.

SIPHONINOIDES LAEVIGATA (Howchin)

Plate 4, figs. 6 *a*, *b*

Truncatulina echinata H. B. Brady, var. *laevigata* HOWCHIN, Trans. Proc. Roy. Soc. So. Australia, vol. 12, 1889, p. 13, pl. 1, fig. 8.

Test subglobular; the chambers indistinct; wall smooth; aperture nearly circular with a slight lip but no neck.

Diameter about 0.35 mm.

Howchin's types came from the Tertiary, (Balcombian) from Muddy Creek, Victoria, Australia. I have topotype material through the kindness of W. J. Parr. The specimens seem sufficiently distinct from Brady's species to warrant giving it specific rank.

SIPHONINOIDES ECHINATA (H. B. Brady)

Plate 4, figs. 7 *a*, *b*, 8 *a*, *b*

Planorbulina echinata H. B. BRADY, Quart. Journ. Micr. Sci., vol. 19, 1879, p. 283, pl. 8, figs. 31 *a-c*.

Truncatulina echinata H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 670, pl. 96, figs. 9-14.

Test subglobular, the chambers irregularly trochoid, sutures slightly depressed, often indistinct; surface covered with short blunt spines; aperture circular with a short neck and thickened lip.

Numerous specimens have been referred to this species by different authors not all of which may belong here. In the Muddy Creek beds of Victoria, Australia there are specimens similar to that figured (pl. 4, figs. 7 *a*, *b*) which may be referred to Brady's species which are all from the Indo-Pacific.

The specimen figured (pl. 4, figs. 8 *a*, *b*) from the Atlantic, off the Tortugas, may prove to be a distinct species. The projections of the surface are very few in number and the wall is thick and conspicuously perforate.

SIPHONINOIDES GLABRA (Heron-Allen and Earland)

Truncatulina glabra HERON-ALLEN and EARLAND, Trans. Zool. Soc. London, vol. 20, 1915, p. 711, pl. 52, figs. 41-47.

“Test nearly spherical, consisting of about two to three convolutions of chambers; three to four chambers in the last convolution, which is inclined at an angle to the axis of the preceding ones, so that the early convolutions are almost, or entirely, inclosed. Shell-wall somewhat thick, but much thinner than in *T. echinata* Brady

and coarsely perforate. Sutural lines depressed. Aperture situated in a depression at the junction of the terminal chamber with the preceding convolution, usually a simple crescentic slit, sometimes furnished with a rim or a short neck as in *T. echinata*."

The types are from the Kerimba Archipelago off Southeastern Africa, but the authors also record it from off Tahiti. Brady's *Challenger* material, according to Heron-Allen and Earland, is at least partially of this species and they refer *Challenger* Report (pl. 96, fig. 12) to their species.

EXPLANATION OF PLATES

(In all figures *a*, dorsal view, *b*, ventral view, and *c*, apertural view.)

PLATE 1

- FIGS. 1 *a-c*. *Siphonina reticulata* (Czjzek). (After type figure of *Siphonina fimbriata* Reuss.)
 2 *a-c*. *Siphonina reticulata* (Czjzek). (After type figure of *Rotalina reticulata* Czjzek.)
 3 *a-c*. *Siphonina tubulosa* Cushman. (After H. B. Brady.)
 4 *a-c*. *Siphonina bradyana*, new species. (After H. B. Brady.)
 5 *a-c*. *Siphonina tubulosa* Cushman. Specimen from Samoa. $\times 65$.
 6 *a-c*. *Siphonina jacksonensis* Cushman and Applin. Specimen from type locality, 4 miles east of Diboll, Tex. $\times 65$.
 7 *a-c*. *Siphonina advena* Cushman. From Lower Oligocene, Byram marl, Byram, Miss. $\times 65$.

PLATE 2

- FIGS. 1 *a-c*. *Siphonina wilcoxensis*, new species. From Nanafalia Bluff, Tombigbee River, Ala. $\times 100$.
 2 *a-c*. *Siphonina wilcoxensis*, new species. From 2 miles south of Meridian, Lauderdale County, Miss. $\times 100$.
 3 *a-c*. *Siphonina wilcoxensis*, new species. From Tuscahoma Landing, Tombigbee River, Ala. $\times 100$.
 4 *a-c*. *Siphonina prima* Plummer. From shallow ditch at road corner southeast of New Corsicana reservoir on the road to Mildred, Navarro County, Tex. $\times 100$.
 5 *a-c*. *Siphonina pulchra* Cushman. Recent. Off Tortugas, Fla. $\times 65$.
 6 *a-c*. *Siphonina australis*, new species. Holotype. From Muddy Creek, Victoria, Australia. $\times 65$.

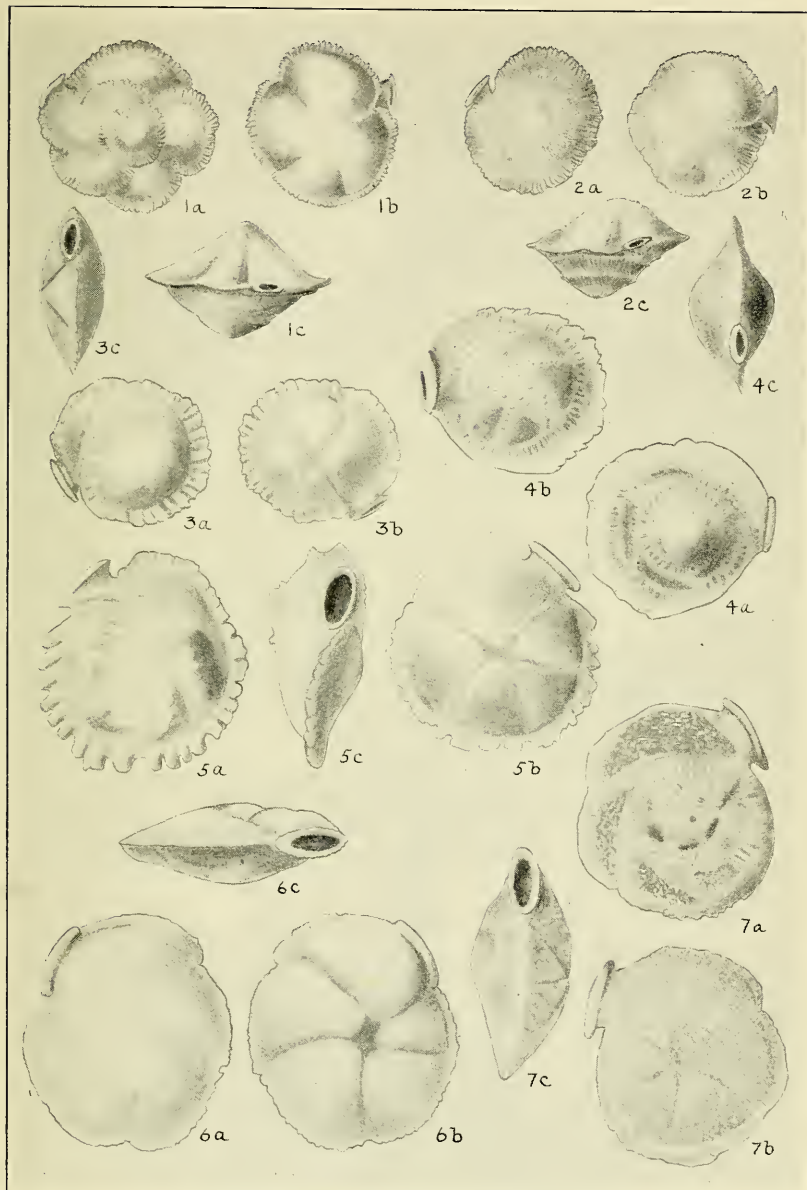
PLATE 3

- FIGS. 1 a-c. *Siphonina tuberculata* (A. Silvestri). From Pliocene of Siena region, Italy. (After A. Silvestri.) $\times 40$.
- 2 a-c *Siphonina plano-convexa* (A. Silvestri). From Pliocene of Siena region, Italy. (After A. Silvestri.) $\times 37$.
- 3 a-c. *Siphonina lamarckana* Cushman, new species. Holotype. From Eocene, Calcaire grossier, Grignon, France. $\times 60$.
- 4 a-c. *Siphonina reticulata* (Czjzek). From Miocene of Kostej, Banat region of Hungary. $\times 65$.
- 5 a-c. *Siphonina claibornensis*, new species. Holotype. From Lisbon formation, 1 mile north of Washitubbee station, N. O. & N. E. R. R., Clarke County, Miss. $\times 65$.
- 6 a-c. *Siphonina howei*, new species. Holotype. From Claiborne Eocene, Cane River formation at Natchitoches, La. $\times 65$.
- 7 a-c. *Siphonina australis*, new species. From Miocene of Filter Quarry, Batesford, Victoria, Australia. $\times 65$.
- 8 a-c. *Siphonina australis*, new species. From Miocene, Janjukian, Bird Rock Cliffs, Torquay, Victoria, Australia. $\times 65$.

PLATE 4

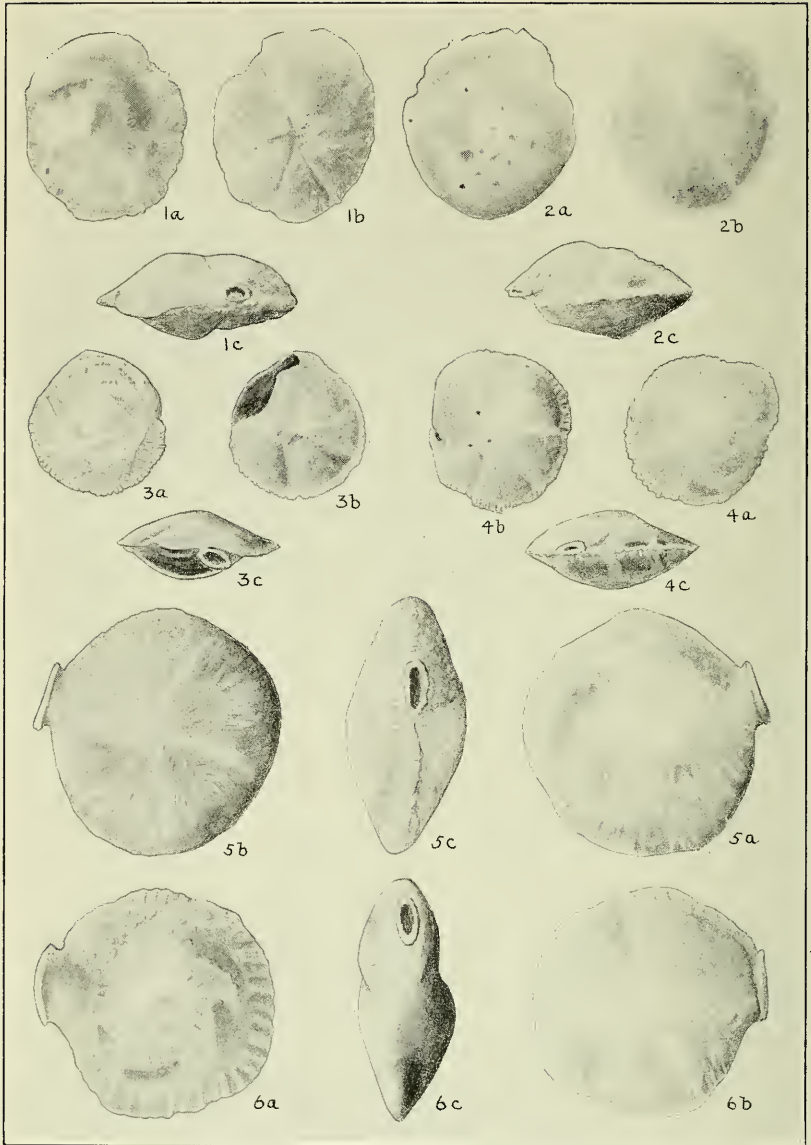
- FIGS. 1 a-c. *Siphonina tenuicarinata* Cushman. Specimen from Brasso, Trinidad. $\times 65$.
2. *Siphonina jacksonensis* Cushman and Applin, var. *limbosa* Cushman, new variety. Holotype. From Alazan clay, Rio Buena Vista, Vera Cruz, Mexico. $\times 65$.
- 3 a-c. *Siphonina advena* Cushman, var. *cocenic*a Cushman and Applin. From Jackson Eocene, Bridge Creek, $1\frac{1}{2}$ miles above Angelina River, Tex. $\times 65$.
- 4 a-c. *Siphonina philippinensis*, new species. Holotype. From Philippines, Albatross Station D5242. $\times 65$.
- 5 a-c. *Siphoninella claibornensis* Cushman and Howe. Holotype. From Louisiana. $\times 100$.
- 6 a-b. *Siphoninoides laevigata* (Howchin). From Muddy Creek, Victoria, Australia. $\times 65$.
- 7 a-b. *Siphoninoides echinata* (H. B. Brady). From Muddy Creek, Victoria, Australia. $\times 65$.
- 8 a[c]-b. *Siphoninoides echinata* (H. R. Brady). From Tortugas, Florida. $\times 65$.





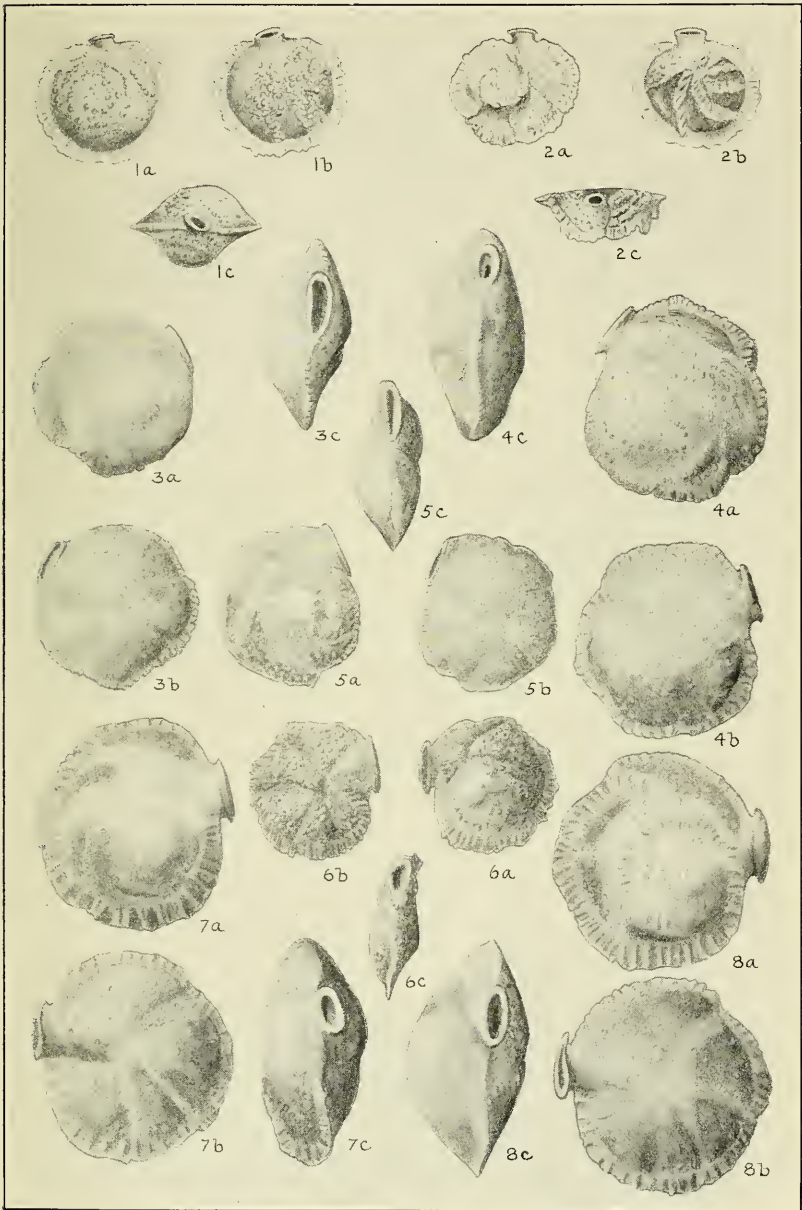
FORAMINIFERA OF THE GENUS SIPHONINA

FOR EXPLANATION OF PLATE SEE PAGE 14



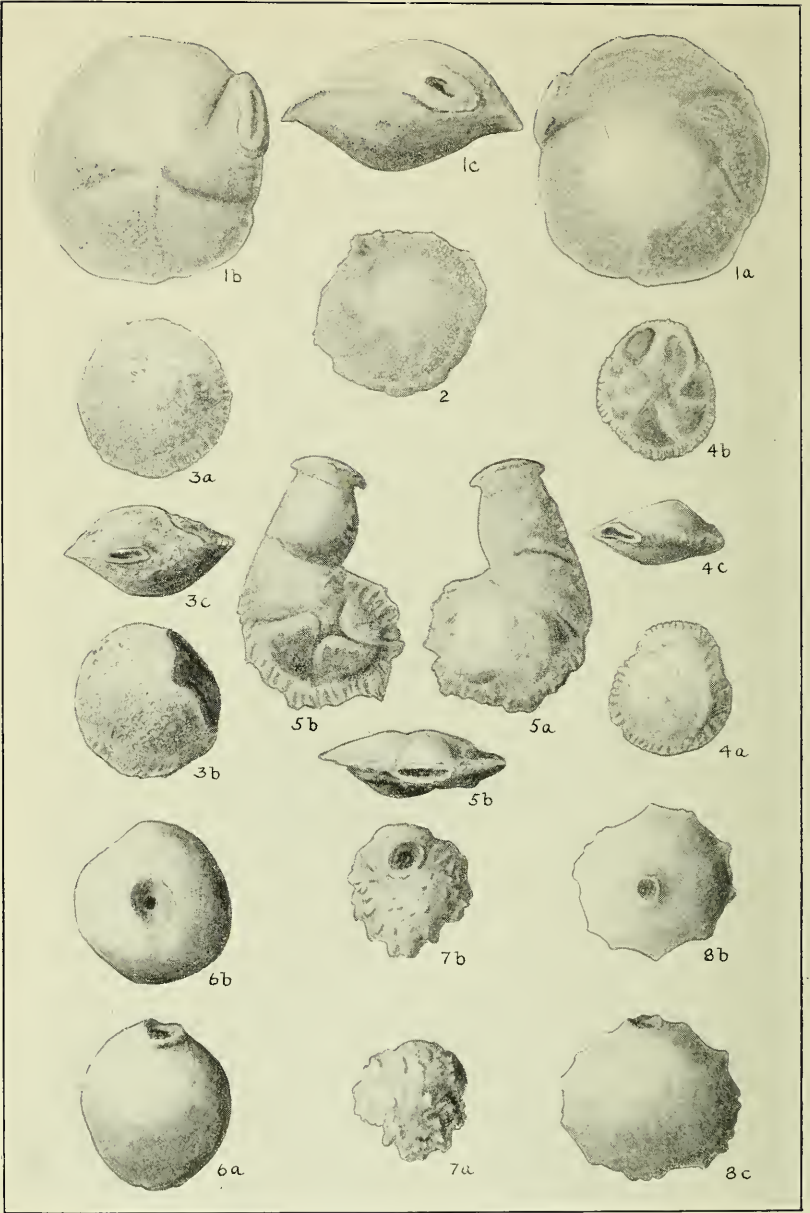
FORAMINIFERA OF THE GENUS SIPHONINA

FOR EXPLANATION OF PLATE SEE PAGE 14



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FORAMINIFERA OF THE GENUS SIPHONINA

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