Foraminifera of the Lodo Formation Central California

Part 2, Calcareous Foraminifera (Miliolidae and Lagenidae, part)

GEOLOGICAL SURVEY PROFESSIONAL PAPER 240-B

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By M. C. ISRAELSKY

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A study of the foraminiferal fauna of a Paleocene and Eocene formation of scientific and economic importance

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FORAMINIFERA OF THE LODO FORMATION CENTRAL CALIFORNIA

By

M. C. Israelsky

PART 2, CALCAREOUS FORAMINIFERA (MILIOLIDAE AND LAGENIDAE, PART)

ABSTRACT

In part 2 are described and illustrated 169 species or other systematic variations, one a miliolid, the others belonging to the lagenid genera *Cristellaria*, *Robulus* and *Hemirobulina*. Most of the systematic variations are too rare to merit naming. Their observed stratigraphic distribution is shown in a table.

STRATIGRAPHIC DISTRIBUTION OF MILIOLIDAE AND LAGENIDAE, PART

The distribution of the 169 forms here considered in the sampled sections of the Lodo formation is shown in the table (in pocket). The thickness of the sections and the stratigraphic positions of the samples listed in the table are shown in plate 1 (in pocket, Part I). The names of the Foraminifera are listed from left to right in order of their highest stratigraphic appearance within each genus.

SYSTEMATIC DESCRIPTIONS

Family MILIOLIDAE

Except for the following form, the family is represented in this section of the Lodo formation by only a few internal molds, probably of *Quinqueloculina*.

Genus SIGMOILINA Schlumberger 1887

Sigmailina? frequens Israelsky n. sp.

Plate 12, figures 1–13

Test compresed, proportions of length to width somewhat variable, lateral surfaces subflattened, concave-convex transversely, thickest near rounded periphery, width of exposed portions of chambers subequal, with either the final pair or earlier chambers appearing slightly the wider; chambers and sutures flush, though refraction makes the former appear raised and the latter depressed; last chamber terminated with neck that tends to point along the longitudinal axis, the opposite end of last chamber projecting in varying degree; aperture a subelliptical to circular opening in the terminal neck without tooth or swelling; in transverse cross section test weakly signoid, the microspheric form (plate 12, fig. 8) showing the first two chambers twisted about 40 degrees with respect to a median line and cavities lie on a distinctly sigmoid line; megalospheric form less obviously sigmoid.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Paratype	67	548951	0.36	0.19	0.06
Holotype	67	548952	.38	.26	.06
Paratype	75	548953			
Paratype	75	548954	.39	.24	.06
Paratype	75	548955			

Very similar is *Sigmoilina tenuis* (Czjzek), the type figure of which was reillustrated by Cushman (1946a, pl. 5, fig. 13, Miocene), though that species appears more compressed, has chambers increasing more noticeably in width with growth, and has the test proportionately narrower and with the early end of the final chamber projecting less strongly. Cushman's description (p. 32) does not mention a tooth, but does note that the early portion is quinqueloculine.

S. frequens is probably the species referred to by L. Martin (1943, p. 12. Eocene) as *Spiroloculina* sp. of Church (1931, pl. A, fig. 11, Eocene). Church's form appears more like *Sigmoilina tenuis* (Czjzek) than the present species.

The sigmoid cross section precludes this species being placed in *Spiroloculina*, the lack of a quinqueloculine early portion is abnormal for *Sigmoilina* and the early portion of the microspheric form seems biloculine as in *Flintia*. Each of these three genera has a toothed aperture.

The closest relationship apears to be with *Sigmoilina* and there the species is tentatively so placed.

Family LAGENIDAE

In measurements given for the coiled lagenids the length is considered to be the distance from the apical

angle through the center of the umbo (or umbilicus) to the periphery. Width is considered the distance between two lines erected parallel to the length and tangent to the periphery (text fig. 3).

Marie's (1941, p. 97, 98) terms "greater" or "final" diameter coincide with the present use of "length." His "median diameter" is the distance along a line at right angles to the length (his greater diameter) through the center of the umbo, between the two intercepts with the periphery. In the tightly coiled forms width as here used agrees closely with Marie's median diameter; in the more eccentric forms a marked departure may result.

Marie's scheme, proposed for planispiral Foraminifera in general, affords a method of expressing the degree in which the spiral flares. It appears that the method lends itself to evolute forms, although it would be more readily applicable to involute forms if they were sectioned.

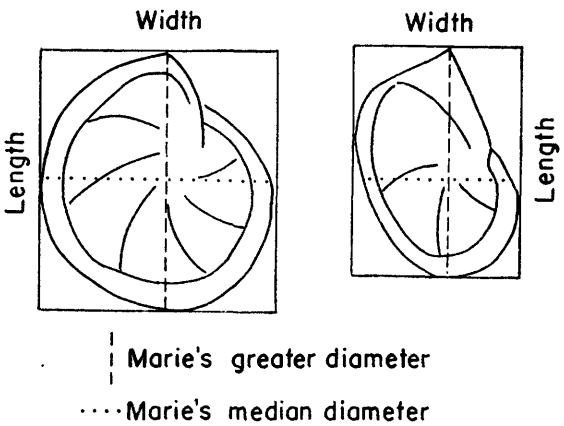

FIGURE 3.—Measurements of lagenid Foraminifera.

Genus CRISTELLARIA Lamarck 1816

In using *Cristellaria* Lamarck 1816 rather than *Lenticulina* Lamarck 1804 the reasoning of H. E. Thalmann (1949, pp. 508–509) has been accepted. His contention that the original figure of the genotype of *Lenticulina*, *Lenticulina* (*Lenticulities*) *rotulata* Lamarck 1804 (figured 1806), does not represent a foraminifer seems justified. Certainly the Foraminifera subsequently assigned to this species have little resemblance to the original figure.

Fortunately, as Thalmann points out, *Cristellaria* Lamarck 1816 with the genotype *Cristellaria producta* Lamarck 1816, is available.

Cristellaria proinops Israelsky n. sp.

Plate 12, figures 14, 15

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest chamber meeting in an obtuse angle, sutures strongly depressed, radiating from umbo, last suture strongly reflexed, others nearly straight, meeting periphery at high angles, greatest width about two-thirds of axial distance from aperture, keel at reentrants between outer margins of chambers, height of chambers at periphery irregular; in edge view subelliptical, greatest thickness through final chamber, aperture terminal with weak short radiating ridges.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	518956	0.75	0.57	0.43

Cristellaria inops Reuss (1851b, pl. 8, fig. 5 Tertiary) is related but is proportionally narrower, with straight sutures throughout and a more central umbilicus.

The form called *Robulus oligostegius* (Reuss) by Cushman (1946, pl. 17, figs. 16, 17, Cretaceous) has only the later chambers inflated.

Cristellaria sp. A

Plate 12, figures 16, 17

In side view roundly subquadrangular, peripheral margins of chambers irregularly varying from strongly rounded to nearly straight, final margin of last chamber and periphery of earliest visible chamber meeting without offset, sutures flush, gently reflexed, varying as to angle in which they meet periphery, umbonal area subcentral, height of chambers at periphery irregular, well defined rounded rim in early portion of periphery, obscure in later; in edge view broadly subelliptical, slightly produced at either end, septal face convex, not distinctly separated from the lateral faces of the final chamber; aperture terminal in protruding subconoidal process with a few radiating striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	45	548957	0.55	0.45	0.35

The apertural process in the figured specimen is broken and the description of it is made from a smaller specimen from the same sample.

Cristellaria sp. B

Plate 12, figures 18, 19

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin meeting periphery of earliest visible chamber in an obtuse angle, sutures flush, earliest meeting periphery at nearly 45 degrees, angle increasing to nearly 90 degrees with the last suture, umbo central, height of chambers at periphery irregular, well defined keel on all chambers; in edge view subelliptical, greatest thickness through umbos, apertural end strongly produced, septal face flatly con-

vex and rounding into lateral faces of final chamber, apertural process poorly defined, aperture apparently terminal with three radiating ridges on final face.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	78	548958	0.55	0.45	0.25

Robulus iotus (Cushman) as figured by Cushman and Cahill (1933, pl. 4, fig. 1, Miocene) has some resemblance in edge view but is proportionately thinner, has more strongly bowed sutures and lacks the conspicuous keel of *Cristellaria* sp. B.

Cristellaria? sp. C

Plate 12, figures 20, 21

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, earlier sutures raised, last two depressed with corresponding inflation of last two chambers, sutures nearly straight, tangential to umbo, inclined backwards and meeting the periphery at about 45 degrees except for the last two which approximate 60 and 90 degrees respectively, umbo subcentral, height of chambers at periphery increasing regularly, well defined thin keel on all chambers; in edge view subelliptical, produced at end away from aperture, outline from umbos to apertural end somewhat sinuous, greatest thickness through umbos, apertural area broken but apparently terminal and simple.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	70	548959	0.48	0.45	0.23

A form referred to *Lenticulina* cf. *theta* Cole by Cushman and R. E. and K. C. Stewart (1947, pl. 11, fig. 3, Eocene) resembles *C* (?) sp. C superficially but is proportionately both narrower and thinner. Sutural detail cannot be made out in their figures. *Lenticulina guayabalensis* Cole (1927, pl. 1, figs. 3, 4, Eocene) has comparatively thicker rims and lacks the inflated final chambers of *Cristellaria* sp. C.

Cristellaria sp. D

Plate 12, figures 22, 23

In side view subovate, periphery and final margin of last chamber forming an acute angle, final margin of last chamber and periphery of early portion of test meeting in an obtuse angle, sutures broad, flush, very slightly reflexed, the last almost perpendicular to periphery, umbonal area central, well-defined rim on periphery; in edge view subelliptical, thickest through umbonal region, septal face convex and grading smoothly into lateral faces of final chambers; aperture terminal with fine radial grooving.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	80	548960	0.28	0.21	0.12

Cristellaria sp. D is similar in side view to *Robulus* sp. BN but lacks the robuline slit and flattened final face of that species.

Cristellaria mediolodensis Israelsky n. sp.

Plate 12, figures 24, 25

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber merging with periphery of earliest visible chamber without offset, sutures flush, earliest radial, nearly straight and meeting periphery at nearly 90 degrees, later sutures tangential to umbo, two previous to last weakly reflexed, meeting periphery at about 45 degrees, the last slightly sinuous and meeting periphery at nearly 90 degrees, umbo slightly eccentric, height of chambers at periphery irregular, rim well defined on early chambers, poorly defined on later; in edge view subelliptical, weakly produced at either end, greatest thickness through umbos, final face strongly convex blending imperceptibly into lateral faces of final chamber; aperture terminal with few radial striae.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	65	548961	0.53	0.43	0.25

Figures referred by Bandy (1949, pl. 8, fig. 3, Oligocene) to *Robulus convergens* (Bornemann) are superficially similar but his form is proportionately broader, more umbonate, all sutures tangential and a robuline slit is present.

Cristellaria convergens Bornemann of Brady, (1884, pl. 69, figs. 6, 7, Recent) has less excentric umbos, is proportionately thinner and also shows a robuline slit.

Cristellaria socia Israelsky n. sp.

Plate 12, figures, 26–29

In side view, subovate, apertural end acutely pointed, opposite end rounded, final margin and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, all tangential to umbo, strongly reflexed, meeting periphery at about 45 degrees, umbo slightly eccentric, height of chambers at periphery irregular, fairly well defined rim present, better developed on large than on small specimens; in edge view subelliptical, somewhat produced at end away from aperture, greatest thickness through umbos, septal face heart-shaped, weakly convex and rounding into lateral faces of final chamber; apertural process subconoidal, aperture terminal with radial ridges and grooves.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	67	548962	0.58	0.49	0.30
Paratype	67	548963	.63	.53	.35

The opening near the aperture in fig. 27 is due to breakage.

This species bears a close resemblance to *Robulus fresnoensis* Israelsky n. sp. but that species has a partially angulate outline, a less distinctive apertural process without striae, a more convex final face and a robuline slit.

Cristellaria sp. E

Plate 12, figures 30, 31

In side view, subovate, roundly subtrigonal, bluntly pointed at apertural end, rounded at opposite end, final margin strongly bowed, meeting periphery of earliest visible chamber in a high obtuse angle, sutural bands flush, weakly reflexed, narrowing from umbo toward periphery, all except earliest sutures meeting periphery at about 45 degrees, first few sutures radial from umbo, later sutures tangential to umbo, umbo subcentral, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face elongate heart-shaped, strongly convex and merging imperceptibly with lateral faces of final chambers, apertural process subconoidal, aperture terminal with some radial striae present.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	59	548964	0.50	0.40	0.20

A form figured by Cushman (1922, pl. 4, fig. 2, side view only, Oligocene) as *Cristellaria convergens* Bornemann has superficial resemblance but is much closer coiled and the final suture is much less curved.

Cristellaria ? sp. F

Plate 12, figures 32, 33

In side view subovate, apertural end bluntly pointed, opposite end rounded, periphery of final chamber straightened, giving an angulate appearance, final margin merging into periphery of first visible chamber without offset, sutural bands flush, weakly reflexed, irregularly varying from tangential to radiate from umbo, meeting periphery irregularly at from about thirty degrees to right angles, umbo eccentric, height of chambers at periphery irregular, well defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face strongly convex, heart-shaped, merging smoothly with lateral faces of final chamber, apertural region broken, probably with simple terminal radiate aperture.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	64	548965	0.40	0.33	0.23

This form is much like *Robulus fresnoensis* Irsaelsky n. sp., but even the relatively small specimen figured shows a more eccentric umbo. The apertural process of *C.* sp. F probably projects more than that of *R. fresnoensis.*

Cristellaria sp. G

Plate 12, figures 36, 37

In side view angulate ovate, the final chamber broadly pointed, the opposite end rounded, periphery of early portion smoothly curved, that of each of the last two chambers nearly straight and meeting at an obtuse angle, final margin and periphery of earliest visible chamber meeting at a high obtuse angle, sutures flush, reflexed, umbo eccentric, peripheral height of earlier chambers subequal, height of last two each nearly three times that of the earlier chambers, periphery with weak suggestion of rim; in edge view, subelliptical, compressed, slightly produced at either end, greatest thickness through umbos, septal face convex, not distinctly separated from lateral faces of final chamber, apertural process subconoidal, prominent, aperture terminal, no radial striae observed.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	39	548966	0.48	0.38	0.22

In side view this species might easily be mistaken for *Robulus* sp. BS. but that species has a depressed final face and a robuline slit.

Cristellaria sp. A. is similar but lacks the crowded early chambers and at the same size stage has but one chamber with straightened periphery and the sutures become more nearly tangential to the umbo.

Cristellaria subangulata Reuss as interpreted by Franke (1925, pl. 6, fig. 11, Cretaceous) seems to be the most similar figured form but its length is proportionally greater, its umbo is more eccentric, the peripheral height of its chambers is more regular and the final margin meets the periphery of the earliest visible chamber in a low, rather than high, obtuse angle.

Cristellaria sp. H

Plate 12, figures 38, 39

In side view subovate, apertural end acutely pointed, opposite end rounded, periphery of last three chambers straightened with resultant angulate appearance, final margin of last chamber forming obtuse angle with periphery of first visible chamber, sutures flush, gently reflexed, first visible suture tangent to umbo, remainder radiate, first suture meeting periphery at about 45 degrees, others at nearly right angles, umbo subcentral, somewhat raised, no rim apparent, height of

chambers at periphery irregular; in edge view subelliptical, slightly produced toward both ends from umbo, greatest thickness through umbos, contact between lateral faces sharp, acutely rounded, septal faces broken on available specimens, probably strongly convex, aperture terminal, radiate in unfigured specimen from sample 81.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	10	548967	0.85	0.71	0.43

The nearest figure appears to be that of *Cristellaria polygona* Perner (1892, pl. 5, figs. 3, 4, Cretaceous) but that species is angulate throughout, more closely coiled and proportionally thicker than *Cristellaria* sp. H. *Robulus pondi* Cushman (1931a, pl. 2, fig. 9, Cretaceous) is also angulate throughout, but the umbo is more nearly central.

Cristellaria sp. I

Plate 12, figures 34, 35

In side view broadly subovate, the apertural end obtusely pointed, opposite end rounded, periphery of each of last four chambers tending to straighten giving an angulate appearance, final margin of last chamber and periphery of earliest visible chamber meeting without offset, a weak node present at the peripheral juncture of the last two chambers, sutures nearly straight, slightly reflexed, meeting periphery at high angles, umbo subcentral, height of chambers at periphery increasing gradually, weak rounded rim present on all chambers; in edge view subelliptical, greatest thickness through umbonal area, septal face heart-shaped, convex, blending imperceptibly into lateral faces of final chamber; aperture terminal in protruding compressed conoidal process, without apparent radial striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	63	548968	0.50	0.45	0.26

The specimen figured by Cushman and Stainforth (1945, pd. 2, fig. 24, side view only, Oligocene) as *Robulus* cf. *alato-limbatus* (Gümbel) is very similar in appearance but is more angulate at the junction of the final margin of the last chamber with the periphery of the earliest visible chamber and has a robuline aperture.

Cristellaria sp. J.

Plate 12, figures 42, 43

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber forming a wide obtuse angle, sutures flush, gently reflexed except last which is nearly straight, radiate, all meeting periphery at high angles, periphery of last two chambers tending to straighten, giving weakly angulate appearance, umbo very eccentric, height of chambers at periphery irregular, well developed rim on first few chambers only; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbonal area, septal face heart-shaped, convex, merging into lateral faces of final chamber, aperture terminal in subconoidal process with fine radiating striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	89	548969	0.55	0.38	0.25

The form figured by Franke (1927, pl. 2, fig. 18, Paleocene) as *Cristellaria beyrichi* Bornemann is very similar, but has more numerous chambers, the sutures are more strongly arched and a callus is lacking at the umbo. Large suites from the two localities might well show the two forms to be intergradational.

Cristellaria sp. K

Plate 12, figures 44, 45

In side view subovate, apertural end acutely pointed, opposite end rounded, periphery of last two chambers straightened, resulting in an angulate appearance, final margin of last chamber merging with periphery of earliest visible chamber without offset, sutures flush, gently reflexed, meeting periphery at various angles, about 45 to 90 degrees without regular sequence, umbo slightly eccentric, height of chambers at periphery irregular, rim poorly defined; in edge view subelliptical, greatest thickness through umbo, septal face heart-shaped, somewhat flattened, rounding into lateral faces of final chamber; aperture terminal in subconoidal process with radiating ridges.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	106	548970	0.27	0.20	0.14

Cristellaria sp. L

Plate 12, figures 46, 47

In side view subhemicircular, apertural end acutely pointed, opposite end rounded, final face of last chamber and periphery of earliest visible chamber meeting in almost a straight line, sutures flush, slightly reflexed, meeting periphery at angles approaching 90 degrees, radiate from umbo, umbo strongly eccentric, raised, height of chambers at periphery apparently increasing regularly, poorly developed rim on early portion of periphery only; in edge view fusiform, produced at both ends, greatest thickness through swollen umbos, septal face convex, elongate, about three times as long as thick, bounded laterally by umbonal area and lateral faces of final chambers into which it grades imperceptibly

tibly; aperture terminal in produced subconical process with radiating striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	6+1′	548971	0.26	0.18	0.13

The form called *Lenticulina navicula* (d'Orbigny) by Cushman and Renz (1946, pl. 3, fig. 26, Cretaceous) has some resemblance but is not fusiform in edge view. Their form is not conspecific with that figured under the same name by Cushman and Jarvis (1932, pl. 7, fig. 5, Cretaceous) which has an inflated final chamber and differs otherwise from Cushman and Renz's form and from *Cristellaria* sp. L.

Cristellaria? sp. M

Plate 12, figures 40, 41

In side view subovate, apertural end acutely pointed, opposite end rounded, periphery of at least each of last three chambers straightened, giving angulate appearance, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures raised, gently reflexed, radial, meeting periphery at 45 degrees and higher angles, umbo eccentric, somewhat raised, height of chambers at periphery increasing irregularly, well-defined rim on all chambers; in edge view subelliptical, thickest through umbo, weakly produced toward either end, septal face of available specimens broken, probably weakly convex, aperture not seen but probably terminal.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	74	548972	0.75	0.63	0.31

Robulus pondi Cushman (1946, pl. 16, figs. 1–5 Cretaceous) and *Cristellaria secans* Reus var. *angulosa* Chapman (1896, pl. 1, fig. 4, Cretaceous) are both related but each is angular throughout its periphery.

Cristellaria? sp. N

Plate 12, figures 48, 49

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in slight sinus, sutural bands gently reflexed, meeting periphery irregularly from about 45 to nearly 90 degrees, radial from umbo, umbo eccentric, height of chambers at periphery increasing gradually, poorly defined rim on periphery of all chambers; in edge view subelliptical, greatest thickness through umbos, septal face convex, elongate, grading imperceptibly into lateral faces of final chamber, apertural area broken in available specimens but aperture probably terminal.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	70	548973	0.25	0.18	0.11

Cristellaria sp. O

Plate 12, figures 50, 51

In side view subovate, tending toward an irregular half circle, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a high obtuse angle, sutural bands weakly reflexed, inclined in direction of growth, radial, meeting periphery at high angles, varying irregularly from about 45 to nearly 90 degrees, umbo very eccentric, somewhat callused, height of chambers at periphery irregular, well defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, slightly produced at end away from aperture, septal face flatly convex, subtrigonal, rounding into lateral faces of final chamber; aperture terminal in subconoidal process with radiate ridges.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	70	548974	0.38	0.29	0.20

Cristellaria basilodoensis Israelsky n. sp.

Plate 12, figures 51, 52

In side view broadly subelliptical, rapidly uncoiling, apertural end acutely pointed, opposite end rounded, final margin of last chamber forming an obtuse angle with early portion of keel, sutures flush, gently reflexed, earlier sutures radial, meeting periphery at angles of about 45 degrees, last suture not returning to umbo, resulting in two uniserial chambers, umbo eccentric, height of chambers at periphery irregular, thin keel present on the early visible chambers; in edge view subelliptical, greatest thickness through umbos, sides somewhat compressed, ends produced, septal face convex, grading into lateral faces of final chamber; aperture terminal in produced subconoidal process, no definite striae noted.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	548975	0.73	0.53	0.23

A figure referred to *Robulus discrepans* (Reuss) (Cushman, 1946, pl. 17, fig. 15, Cretaceous) is very similar in side view, but has a concave final face and a robuline slit.

Though none of fairly numerous specimens shows an elongate uniserial portion the species might perhaps be better placed in *Vaginulinopsis*.

Cristellaria sp. P

Plate 12, figures 54, 55

In side view subovate, irregularly weakly angulate, apertural end acutely pointed, opposite end rounded, final margin and periphery of earliest visible chamber

forming very wide obtuse angle, sutures flush, gently reflexed, radiate from umbo, earlier sutures not discernible, last two meeting periphery at about 45 degrees, umbo eccentric; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, weakly convex, rounding into lateral faces of final chamber; apertural process subconoidal, aperture terminal with radiate ridges appearing on the final face giving the false appearance of a robuline aperture.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	71	548976	0.25	0.20	0.12

Cristellaria sp. Q

Plate 13, figures 1, 2

In side view angulate ovate, the final chamber broadly pointed, the opposite end rounded, periphery of early portion smoothly curved, that of each of the last two chambers nearly straight, meeting at an obtuse angle, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, gently reflexed, radial from umbo, umbo eccentric, height of last three chambers at periphery subequal, suggestion of rim only; in edge view subelliptical, slightly produced at apertural end, greatest thickness through umbos, septal face convex, not distinctly separated from lateral faces of final chamber, aperture terminal in protruding compressed subconoidal process, no radial striae noted.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	6+1′	548977	0.95	0.75	0.45

The closest figure appears to be one referred to *Cristellaria convergens* Bornemann by Cushman (1921, pl. 44, fig. 4, Recent) but that form is thinner and less angulate, its later sutures are more tangential, and an earlier whorl is exposed in the umbonal area.

Cristellaria sp. G has similar outlines but the preangulate chambers are much more crowded. Possibly it represents the microspheric form of *Cristellaria* sp. Q.

Cristellaria sp. R

Plate 13, figures 3, 4

In side view roundly subtrigonal, final chamber acutely pointed, apertural process somewhat produced, opposite end rounded, periphery of final chamber nearly straight, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, nearly straight, meeting periphery at from about 45 to nearly 90 degrees, early sutures radial, last tangential to umbo and transgressing it, umbo very eccentric, height of chambers at periphery irregular, weak rim on early chambers; in edge view broadly subelliptical, produced at either end, greatest thickness through umbos, septal face convex, blending imperceptibly into lateral faces of final chamber; aperture terminal, in produced end of final chamber, no radial striae noted.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	89	548978	0.28	0.21	0.18

This form bears a superficial resemblance to *Cristellaria convergens* Bornemann as interpreted by Chapman (1896, pl. 1, fig. 6, Cretaceous).

Cristellaria sp. S

Plate 13, figures 5, 6

In side view subovate, apertural and acutely pointed, opposite end rounded, final margin and periphery of earliest visible chamber meeting without offset, forming an almost straight line, periphery weakly angled at intersections with sutures, sutures flush, straight, radiate from umbo, meeting periphery irregularly at angles ranging from about 45 to nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, rim poorly defined; in edge view subovate, apertural end slightly produced, rim projecting at opposite end, greatest thickness through umbos, septal face convex, merging imperceptibly with lateral faces of final chamber, aperture terminal in subhemispherical process, no radial striae detected.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	22	548979	0.30	0.18	0.13

Cristellaria sp. T

Plate 13, figures 7, 8

In side view elongate, roundly subtrigonal, with parts of five slightly inflated chambers visible, first three visible chambers closely coiled, fourth truncating the first, a broken fifth chamber in contact with only the terminal half of the final face of the fourth chamber, last three chambers practically uniserial, sutures strongly depressed, those of coiled portion radiate, umbo slightly excentric, height of the fully exposed chambers at periphery subequal, no rim nor keel developed; in edge view subelliptical, strongly compressed, thickest through the early coiled portion, sides of fourth visible chamber subparallel with those of the fifth visible chamber converging toward aperture; apertural area not seen.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	38	548980	0.33	0.19	0.10

Cristellaria rotabilis Israelsky n. sp.

Plate 13, figures 9, 10

Test lenticular; in side view subcircular, apertural end very bluntly pointed, opposite end rounded, final margin and periphery of earliest visible chamber forming a high obtuse angle, sutural bands proportionately wide, flush, comma-shaped with greatest width toward umbo, tangent to umbo and meeting periphery at about 45 degrees, umbo central, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, somewhat produced at either end, greatest thickness through umbos, septal face elongate arrow-shaped, strongly concave, bounded on either side by rounded rims; apertural process terminal, subconoidal, with the aperture a simple opening within radiating striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	548981	0.34	0.31	0.18

This species might be mistaken for *Robulus pudibundus* Israelsky n. sp. in side view, but the lack of a robuline aperture and the constricted final face distinguishes it from that apparently longer ranging species.

Cristellaria turbinata Plummer (1926, pl. 7, fig. 4, pl. 13, fig. 2, Eocene) is a similar form but it is notably thinner and its sutures are proportionally narrower and less commalike and tend to be raised. Under the name *Robulus turbinatus* (Plummer), Cushman (1940, pl. 9, fig. 17, Paleocence), Kline (1943, pl. 1, fig. 7, Paleocene) and Harris and Jobe (1951, pl. 3, fig. 15, Paleocene) all illustrate side views only which appear to be Plummer's species. Some other references seem to be in error.

Cristellaria incuriosa Israelsky n. sp.

Plate 13, figures 11, 12

Test lenticular; in side view polygonally subcircular, periphery straightened on all except first two chambers (were it is rounded) some points of angulation not coincident with intersections of sutures and periphery, apertural end obtusely pointed, opposite end angulate, final margin of last chamber straight, meeting periphery of earliest visible chamber in an obtuse angle, sutural bands varying irregularly from straight to gently reflexed, all tangential to umbo and meeting periphery at about 45 degrees, umbo subcentral, well defined, height of chambers at periphery irregular, rim on all chambers; in edge view subelliptical, slightly produced at either end, greatest thickness through umbos, septal face convex, heart-shaped, somewhat depressed, bounded on either side by weak ridges; aperture terminal in subconoidal process with radial ridges.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6?	548982	0.38	0.35	0.18

Cristellaria perna Israelsky n. sp.

Plate 13, figures 13, 14

In side view subovate, roundly subtrigonal, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a high obtuse angle, sutures flush, earlier ones reflexed, later nearly straight, all radiating from umbo, meeting periphery irregularly at angles from about 45 to nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view crudely subelliptical, swollen through the umbos, produced toward either end, septal face flattened, slightly depressed, elongate subtriangular, bounded on either side by low rims; aperture terminal in subconoidal process with radial striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	20	548983	0.55	0.48	0.30

Cristellaria sp. U

Plate 13, figures 15, 16

In side view subovate, weakly subquadrate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, very gently reflexed, almost straight, tangent to umbo, meeting periphery at about 45 degrees, umbo subcentral, somewhat raised, height of chambers at periphery irregular, poorly defined rim present; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, weakly concave, bounded on either side by a low rounded rim, aperture terminal in inconspicuous process with radial ridges.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	18	548984	0.67	0.55	0.36

The darkened radial ridge extending onto the final face gives the false appearance of a robuline aperture in the illustration.

Lenticulina incrassata Marie (1941, pl. 10, fig. 108, Cretaceous) is less quadrate, more loosely coiled and more strongly produced at the end away from aperture than the present form.

Cristellaria sp. V

Plate 13, figures 17, 18

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber

meeting periphery of earliest visible chamber in a high obtuse angle, periphery of last chamber nearly straight giving slight angularity to outline, sutural bands slightly curved, early bands radiate, later tangent to umbo, meeting periphery irregularly at various angles, umbo subcentral, height of chambers at periphery irregular, rim well defined on early chambers, indistinct on later; in edge view outline subelliptical, greatest thickness through umbos, septal face elongate heart-shaped, flattened but not depressed, rounding into lateral faces of final chamber, aperture terminal in produced subconoidal process with radial striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	81	548985	0.40	0.31	0.18

Cristellaria sp. W

Plate 13, figures 19, 20

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, final suture slightly depressed, others flush, all gently reflexed, earlier sutures tangent to umbo, later radiate, sutures meeting periphery at about right angles, umbonal areas eccentric, height of chambers at periphery irregular, rim poorly defined; in edge view subelliptical, compressed, greatest thickness through the umbos, septal face elongate heart-shaped, weakly depressed, bounded on either side by low rounded ridge; aperture terminal in subconoidal projection with radial striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	97	548986	0.38	0.30	0.15

Cristellaria sp. X

Plate 13, figures 21, 22

In side view subovate, apertural end broadly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in wide obtuse angle, periphery of last two chambers straightened giving weak angulate appearance, sutures flush, earliest almost straight, intermediate sutures gently bent, last suture straight, all sutures tangent to umbo, sutures meeting periphery irregularly at various angles from about 45 to nearly 90 degrees, umbo eccentric, callused, height in chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face flattened, elongate, heart-shaped, rounding into lateral faces of final chamber, aperture terminal in subconoidal process with striae present.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	86	548987	0.53	0.43	0.26

Cristellaria sp. Y

Plate 13, figures 23, 24

In side view subcircular, apertural end obliquely pointed, opposite end rounded, final margin of last chamber and perimeter of earliest visible chamber meeting in a high obtuse angle, sutures and chambers flush, except for last chamber which is slightly inflated, sutures tangential to umbilicus, meeting periphery at about 45 degrees, umbilical area polygonal, subcentral, strongly depressed, height of chambers at periphery irregular, rim poorly defined; in edge view subelliptical, greatest thickness through next to last chamber contiguous to umbilicus, septal face subtrigonal, depressed, proportionally minute, bounded on either side by an inwardly beveled ridge; aperture terminal, a subelliptical opening in subconoidal process, no striae noted.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	38	548988	0.41	0.38	0.23

Cristellaria articulatus Reuss var. *texana* Cushman and Applin (1926, pl. 8, fig. 1, Eocene) is also umbilicate but otherwise quite distinct, having radiate sutures and being strongly compressed. Under the name *Robulus articulatus* (Reuss) var. *texana* Cushman and Applin, Cushman (1935, pl. 4, fig. 16, Eocene) repeats the type figure.

Cristellaris budensis Hantkin of Nuttall (1932, pl. 1, fig. 5, Oligocene figured in side view only) is probably even closer but has a narrow thin peripheral flange according to Nuttall, and the umbilicus is noticeably more eccentric.

Cristellaria sp. Z

Plate 13, figures 25, 26

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber meeting in a high obtuse angle, sutures flush, gently reflexed, radiate from umbo, meeting periphery at about 45 degrees, umbo very eccentric, height of chambers at periphery irregular, well defined rim on all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through the last chamber, septal face elongate heart-shaped, weakly depressed, bounded on either side by a low rounded ridge; aperture terminal in subconoidal process, with radial striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	6+1′	548989	1.15	0.90	0.63

Cristellaria sp. AA

Plate 13, figures 27, 28

In side view, subovate, the final chamber obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, gently reflexed, tangent to umbonal area, meeting periphery at about 45 degrees, umbo eccentric, rim on all chambers but best defined on earlier half of periphery; in edge view broadly subelliptical, somewhat produced at end away from aperture, septal face subtrigonal heart-shaped, depressed, bounded on either side by rounded ridge which grades into lateral faces of final chamber; aperture terminal in subconoidal process, weak radial striae present.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	6+1′	548990	0.95	0.80	0.55

Cristellaria sp. Q contrasts in having a somewhat angulate periphery and a convex final face.

Cristellaria sp. AB

Plate 13, figures 29, 30

In side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting without apparent offset, sutural bands flush, except last which is slightly depressed, tangent to umbo, last two sutures nearly straight, meeting periphery at about 60 degrees and nearly 90 degrees respectively, first visible suture strongly reflexed, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through the umbos, septal face subtrigonal, slightly depressed, bounded on either side by low rims that merge into the lateral faces of final chamber; aperture terminal in inconspicuous subconoidal process, with radiating striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	68	548991	0.21	0.18	0.13

This form might be mistaken for *Cristellaria socia* Israelsky n. sp. but that form has an offset final margin and its sutures are markedly more strongly reflexed.

Cristellaria sp. AC

Plate 13, figures 31, 32

In side view subovate, roundly subtrigonal, rapidly uncoiling, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands gently reflexed, last suture slightly depressed, others flush, sutures radiate, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined keel on all chambers, final margin with slightly raised ridge; in edge view subelliptical, greatest thickness through flattened umbos, septal face acutely heart-shaped, slightly depressed, bounded laterally by low rounded ridges; aperture terminal in striate subhemispherical process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	20	548992	0.60	0.44	0.34

Egger's (1899, pl. 11, figs. 7, 8, Cretaceous) version of *Cristellaria williamsoni* Reuss has a superficial resemblance to *Cristellaria* sp. AC, but it is proportionally narrower and thinner, sutures are more numerous and more strongly bent and the greatest thickness is through the last chamber rather than through the umbos.

Cristellaria alucinans Israelsky n. sp.

Plate 13, figures 33, 34

Robulus williamsoni Cushman and Jarvis (not Reuss), U. S. Natl. Museum Proc., v. 80, part. 14, p. 22, pl. 6, fig. 7, 1932. [Cretaceous]

Cushman, Cushman Lab. Foram. Research Contr., v. 17, p. 61, pl. 16, fig. 2, (not fig. 1), 1941. [Cretaceous]

Cushman, U. S. Geol. Survey Prof. Paper 206, p. 54, pl. 18, fig. 3, (not fig. 2). [Cretaceous]

In side view broadly subovate, broadly rounded both at apertural and opposite end, chambers somewhat inflated, rimmed final margin and periphery of earliest visible chamber meeting in an obtuse angle, sutures depressed, gently reflexed, radiate from weak umbilicus, meeting periphery at about 90 degrees, keel on all chambers, umbilical area eccentric; in edge view subelliptical, greatest thickness through final chamber, septal face heart-shaped, depressed, bounded laterally by rounded rims; aperture terminal in subconoidal projection, surrounded by radiating ridges and grooves.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	548993	0.78	0.60	0.45

The most similar figure is that of a specimen from the Lizard Springs formation of Trinidad, B. W. I., which as shown in the above synonomy has been several times repeated. It is almost identical with the present specimen and is considered conspecific.

Cushman and Church (1929, pl. 36, figs. 13, 14, Cretaceous) figure a specimen as *Lenticulina williamsoni* (Reuss). Cushman (1931b, p. 5, fig. 2, Cretaceous) refers a specimen to *Robulus williamsoni* (Reuss) and twice repeats the figures (1941, pl. 16, fig. 1, Cretaceous; 1946, pl. 18, fig. 2, Cretaceous).

Of these figures only that of Cushman and Jarvis representing a specimen which is considered conspecific

to the present form, found in the Lodo formation, is reasonably close to *Cristellaria williamsoni* Reuss (1862, pl. 6, fig. 4, Cretaceous). However, in the side view *Cristellaria alucinans* Israelsky n. sp. is fewer chambered, lacks the partly scalloped periphery, and is narrower and more tightly coiled than Reuss' species. In edge view the present species is much less compressed and, perhaps more important, the greatest thickness is well within the final chamber rather than through the umbilical area.

The specimen referred to *Robulus williamsoni* (Reuss) by Cushman and Renz (1946, pl. 3, fig. 30, Cretaceous) is not the same as the earlier references to that species from the same (Lizard Springs) formation. This specimen has raised rather than depressed sutures and the swollen chambers are lacking.

In an unnumbered Cushman Collection slide labelled "*Robulus arkansasana* Cushman and Todd, Paleocene, Midway, 4.6 miles N. of Fentress, Caldwell Co., Tex. Coll. by L. W. Stephenson" two specimens seem to be *Cristellaria alucinans* Israelsky n. sp.

Of the described West Coast species *Robulus kincaidi* Beck (1943, pl. 102, figs. 1, 7, Eocene) is the most similar but according to the author the sutures are flush. Beck's species is also proportionally wider and has an unusually high final chamber.

Cristellaria sp. AD

Plate 13, figures 35, 36

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, weakly reflexed, sutures radiate from umbo, earlier sutures indistinct but apparently meeting periphery at about 90 degrees, last two meeting periphery at about 45 degrees, umbo strongly eccentric, callused, height of chambers at periphery increasing regularly, well-defined rim on all chambers; in edge view sagittate, greatest thickness through umbos, somewhat produced at end away from aperture, septal face elongate, heart-shaped, depressed, bounded laterally by rounded rims, aperture terminal in radiately grooved process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	78	548994	0.43	0.35	0.25

Cristellaria laimingi Israelsky n. sp.

Plate 13, figures 37, 38

In side view suboblate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a low obtuse angle, periphery of last two chambers straightened giving angulate appearance, inside part of chambers strongly inflated, swollen portion with circular outlines, in later chambers the swellings transversely subelliptical, sutures radiate from umbilicus, strongly reflexed and meeting periphery at nearly 45 degrees except last which intercepts at nearly 90 degrees, umbilicus eccentric, height of chambers at periphery increasing regularly, well-defined thin keel present on all chambers; in edge view crudely subelliptical, somewhat scalloped due to swollen portions of chambers, thickest through last chamber, septal face flattened, bounded laterally by slight ridges, aperture terminal in well-defined subconoidal process without definite striae.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	39	548995	0.43	0.31	0.19

Named for Boris Laiming in recognition of his excellent zonation of the Eocene formations in California.

The most similar figure seems to be that of *Cristelleria protuberans* Cushman (1919 a, pl. 22, fig. 2, side view only, Oligocene), in which, however, the inflated parts are more nearly central within the chambers, the side outline of the final chamber is much more acute and the apertural process is less prominent.

Cristellaria tendami Israelsky n. sp.

Plate 13, figures 39–42

In side view subovate, broadly pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber meeting at an obtuse angle, sutures covered by strongly raised rounded ridges extending various distances from the umbo toward the periphery, differing with the individual, sutures tangent to umbo, intercepts with periphery not clear, umbo eccentric, proportionally larger in the megalospheric (figs. 41, 42) than in the microspheric (figs. 39, 40) form, height of chambers at periphery irregular, well-defined thin keel present on all chambers; in edge view subelliptical, produced in varying degree from umbo toward either end, thickest through umbos, proportionally thicker in the megalospheric than in the microspheric form, septal face heart-shaped, depressed, bounded laterally by rounded rims; aperture terminal in subconoidal process with radial grooves.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	548996	1.45	1.23	0.70
Paratype	6+1′	broken	----	----	----

Cristellaria (*Lenticulina*) *multiformis* var. *rotunda* Franke as interpreted by ten Dam (1944, pl. 1, fig. 9, Paleocene) is very similar in side view, except that it is proportionally narrower, but in edge view ten Dam's

figure is seen to be much more corrugated. This last difference may be due to the specimens from the Lodo formation being worn, and the Dutch and California forms may be conspecific. Neither coincides with Franke's original figures.

Figures 3–5 of Franke (1911, pl. 3, figs. 3–6, Eocene) show a form with outline similar to that of *Cristellaria tendami* Israelsky n. sp. but some of the sutural ridges are noded; figure 6 shows more elongate and uncoiled form with nearly straight sutures that are almost perpendicular to the periphery.

Lenticulina(?) sp. A of Beck (1943, pl. 101, fig. 8, Eocene) is very similar in side view, the only one given, but there are fewer chambers than in the species from the Lodo and although his specimen is much smaller the umbo seems much more eccentric.

A specimen (Cushman Coll. 35302) labeled "*Robulus angustimargo* (Reuss), Middle Oligocene, Septarienthon, Oeding, Westfallen, Germany) has much the same general form but the raised portions of the sutures appear as short broad commas.

Cristellaria evanescens Israelsky n. sp.

Plate 13, figures 43–45

In side view subhemielliptical, greatest width at early end, final margin of last chamber and periphery of earliest visible chamber meeting at an obtuse angle, sutures raised, most strongly at end toward final margin, only three sutures visible, the first truncated by the second, the last two apparently having a common meeting point, final margin with a strongly raised rounded ridge, umbo very eccentric, height of chambers at periphery irregular, well-developed broad thin keel present on all chambers; in edge view sagittate, keel projecting, greatest thickness through penultimate chamber, septal face elongate subtrigonal, depressed, bounded laterally by rounded rims, aperture terminal subconoidal process with indistinct radial ridges.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	87	548997	0.71	0.63	0.41

The closest figure noted is that referred to *Lenticulina secans* Reuss by Brotzen (1936, pl. 3, fig. 10, Cretaceous) which shows a large central boss and all sutures radiate.

Cristellaria varipapillata Israelsky n. sp.

Plate 14, figures 1, 2

In side view subovate, broadly pointed at apertural end, rounded at opposite end, final margin and periphery of earliest visible chamber meeting in an obtuse angle, in early portion of test sutures with strong beadlike covering toward the umbilicus, later sutural ridges elongate, reflexed, not reaching to periphery, irregular beads on early portion, later sutures and final margin reflexed, earlier sutures indeterminate outside of raised portions, umbo very eccentric, height of sutures at periphery probably irregular, well-defined wide thin keel present on all chambers; in side view subelliptical, somewhat produced at end away from aperture, greatest thickness through umbos, septal face elongate heart-shaped, slightly depressed, bounded laterally by low rounded rims; aperture terminal in low subconoidal process, weak suggestion of radial striae present.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	548998	1.23	0.85	0.45

The original figure of *Cristellaria pseudomammiligera* Plummer (1926, pl. 7, fig. 11, Eocene) and various figures referred to as *Robulus pseudomammiligerus* (Plummer) (Cushman, 1940, pl. 9, fig. 16, Paleocene; Cushman and Todd, 1946, pl. 9, fig. 16, Paleocene; Cushman, 1951, pl. 4, fig. 12, Paleocene) are all more closely coiled and the noding is limited to the central area. Kline (1943, pl. 1, fig. 12, Paleocene) figures a specimen in side view in which the later chambers tend to diminish in width and again the beading is confined to the umbonal region.

None of the cited references supplies either an edge view or an explanation of why *Cristellaria pseudomammiligera* was removed to *Robulus*. Several specimens of that species from the Midway group of Texas show a more obese outline in edge view than is shown by *Cristellaria varipapillata* Israelsky n. sp., and lack a robuline aperture.

Cristellaria dissectans Israelsky n. sp.

Plate 14, figures 3, 4

In side view subovate, obliquely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, later sutures strongly reflexed, the last strongly depressed, the preceding several strongly ridged, the ridges reaching varying distances toward the periphery, early sutures not discernible and early chambers with apparently irregular beading, visible sutures radial and meeting periphery at about 45 degrees, umbonal area eccentric, height of chambers at periphery irregular, well-defined broad thin keel present on all chambers; in edge view subelliptical, thickness through umbonal area and final chamber subequal, septal face elongate, heart-shaped, slightly depressed, bounded laterally by low rounded rims; aperture terminal in low subconoidal process, no radial striae observed.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	6+1′	548999	1.80	1.45	0.75

Differs from the preceding species, *Cristellaria varipapillata* Israelsky in its more circular outline and in details of ornamentation.

Cristellaria platypleura Jones (1852, pl. 16, fig. 12, Eocene) is similar both in side and edge views but the sutural ridges seem to be entire and no beaded area is present.

Cristellaria sp. AE

Plate 14, figures 5, 6

In side view subovate, acutely pointed at apertural end, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a low obtuse angle, sutures flush, very gently reflexed, radiate, meeting periphery at about 60 degrees, umbo very eccentric, height of chambers at periphery irregular, thin keel present on early chambers; in edge view subelliptical, greatest thickness through umbos produced at end away from aperture, septal face elongate heart-shaped, slightly depressed, bounded laterally by low rounded rims, aperture terminal, in low subconoidal process, radial striae present.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	6+1′	549000	1.30	1.03	0.35

Only worn-looking specimens of this form were found. It is entirely possible a complete keel was originally present.

Cristellaria? sp. AF

Plate 14, figures 7, 8

In side view subovate, anterior end acutely pointed opposite end rounded, nearly straight margin of final chamber and periphery of earliest visible chamber meeting in a low obtuse angle, early sutures flush, later weakly ridged, all gently reflexed and radial from umbo, meeting periphery at about 45 degrees, umbo very eccentric, swollen, height of chambers at periphery irregular, well defined broad thin keel on all chambers; in edge view sagittate, produced at end away from aperture, greatest thickness through swollen umbos; aperture in question.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	6+1′	549001	1.45	1.10	0.55

In two available specimens the final face is broken away and the character of that face and the aperture remain in doubt.

Both *Robulus klaghammensis* Brotzen (1948, pl. 7, figs. 1, 2, Paleocene) and *Robulus discus* Brotzen (1948, pl. 7, figs. 3–5, Paleocene) are similar but in both species the umbos are subcentral.

The form figured as *Cristellaria d'Orbignyii* (Bailey) by Cushman (1923a, pl. 26, fig, 3. Recent) is very similar in side view, the only one given, but lacks sutural ridges.

Genus ROBULUS Montfort 1808

Robulus? sp. AG

Plate 14, figures 9, 10

Test lenticular; in side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber probably meeting in a low obtuse angle, sutures gently raised, gently reflexed, earlier sutures tangential to and later radiating from umbo, earliest sutures inclined rearward and meeting periphery at about 45 degrees, intermediate sutures meeting periphery at nearly 90 degrees, later inclined toward terminal end and meeting periphery at gradually decreasing angles, umbo subcentral, height of chambers at periphery irregular, well defined keel present on all chambers; in edge view subelliptical with keel projecting, greatest thickness through umbos, septal face heart-shaped, probably depressed, a robuline slit probably present.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	104	549002	1.07	0.98	0.53

Each of the specimens listed under this designation is poorly preserved and it may well be that more than one species is included.

Robulus remissus Israelsky n. sp.

Plate 14, figures 11, 12

Test lenticular; in side view subcircular, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, surface of last chamber strongly depressed inwardly from apertural process, sutures flush, reflexed, radiate from umbo, meeting periphery at about 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined thin keel on all chambers; in edge view subelliptical, produced at either end, greatest thickness through umbos, final face V-shaped; slightly depressed, rounding into lateral faces of last chamber; septal process subconoidal with terminal radial ridges, an elongate collared slit present on final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	78	549003	0.29	0.28	0.15

Robulus chehalisensis Rau (1948, pl. 29, figs. 14, 15, Oligocene) is superficially similar but lacks the con-

spicuous apertural process and keel, and in edge view is not produced at either end.

Robulus sp. aff. Robulus carolinianus Cushman

Plate 14, figures 13, 14

Test lenticular; in side view subcircular, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a low obtuse angle, apertural process conspicuous, sutural bands flush, gently reflexed, tangent to umbo, meeting periphery irregularly at about 30 to nearly 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined narrow thin keel present on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face V-shaped, concave; apertural process subconoidal, with radial ridges terminally, a short collared slit extending onto final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	67	549004	0.38	0.35	0.20

The figure called *Robulus arcuato-striatus* (Hantken) var. *carolinianus* Cushman by Bergquist (1942, pl. 2, fig. 23, side view only, Eocene) is very close and Cushman's type figures (1933, pl. 1, fig. 9, Eocene) are but slightly less so. The form from the Lodo formation is more tightly coiled than either of these and in edge view slopes more gently toward either end.

More specimens are needed to differentiate these forms accurately.

Robulus inenodabilis Israelsky n. sp.

Plate 14, figures 15, 16

Test lenticular; in side view subcircular, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, in part gently reflexed, in part nearly straight, earlier sutures meeting periphery at about 45 degrees, later at nearly 60 degrees, umbo central, height of chambers at periphery irregular, well-defined narrow thin keel on all chambers, apertural process strongly projecting; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, flattened, rounding into lateral surfaces of final chamber; apertural process subconoidal, aperture a narrow subelliptical rimmed opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	69	549005	0.30	0.28	0.14

This species differs from the preceding, *Robulus* sp. aff. *Robulus carolinianus* Cushman in its less circular outline, greater projection of the apertural process and the differences in angles of interception between the periphery and sutures.

Robulus vanus Israelsky n. sp. also differs in the angles of interception between the periphery and sutures.

Robulus vanus Israelsky n. sp.

Plate 14, figures 17, 18

Test lenticular; in side view subcircular, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, periphery of last chamber straightened giving weakly angled appearance, sutural bands flush, gently reflexed, tangent to umbo, meeting periphery at about 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined narrow thick rim on all chambers; in edge view subelliptical, greatest thickness through umbos, final face U-shaped, flattened, very constricted, rounding into lateral faces of final chamber; apertural process subconoidal with radial ridges terminally, aperture an elongate collared slit extending onto final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	69	549006	0.55	0.49	0.31

The straightened periphery of the final chamber and the proportionally thicker rim set this species off from *Robulus* sp. aff. *carolinianus* Cushman and *Robulus inenodabilis* Israelsky n. sp.

Both this species and *Robulus* sp. aff. *carolinianus* Cushman are similar to *Lenticulina* (*Robulus*) *suborbicularis* Parr (1950, pl. 11, figs. 5, 6, Recent) in side view though Parr's figures show the sutures to be more strongly bent; in edge view Parr's species is proportionally thinner and strongly produced toward the apertural end.

Robulus cf. *arcuato-striatus* (Hantken) var. *carolinianus* Cushman of Cushman and Simonson (1944, 1, pl. 30, fig. 10, side view only, Eocene) is in comparison to *Robulus vanus* Israelsky n. sp. markedly compressed in edge view.

Robulus valens Israelsky n. sp.

Plate 14, figures 19, 20

Test lenticular; in side view subcircular, apertural end rounded with projecting apertural process, opposite end rounded, final margin and periphery of earliest visible chamber forming an obtuse angle, sutural bands, notably wide proportionally, gently reflexed, tangent to umbo, meeting periphery irregularly from about 45 degrees to nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined wide

thin keel present on all chambers; in edge view subelliptical, slightly produced at apertural end, greatest thickness through umbos, septal face broadly V-shaped, concave, bounded laterally by rounded rims, apertural process subconoidal with radial striae terminally, aperture an elliptical collared opening in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	78	549007	0.33	0.31	0.18

The most similar figured specimen seems to be that assigned to *Robulus pseudovortex* Cole by Bandy (1949, pl. 8, figs. 9, 10, Eocene) in which, however, the sutural bands are much less conspicuous and the apertural process is not projecting.

Robulus conspissatus Israelsky n. sp.

Plate 14, figures 21, 22

Test lenticular; in side view subcircular, apertural end pointed at nearly 90 degrees, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures, fiush, reflexed, tangent to umbo, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined wide thick keel on all chambers; in edge view subelliptical, only the keel produced, greatest thickness through umbos, septal face elongate heart-shaped, depressed, bounded laterally by rounded rims, apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	80	549008	0.23	0.22	0.13

The decidedly excentric umbo and lack of sutural banding serves to distinguish this form from *Robulus pudibundus* Israelsky n. sp.

In side view there is superficial resemblance to *Cristellaria cultrata* d'Orbigny as figured by Egger (1900, pl. 11, figs. 11, 12, Cretaceous) but that specimen has more strongly curved sutures, the umbo is distinctly raised and there is no robuline aperture.

In *Robulus arcuatostriatus* (Hantken) of Bermudez (1949, pl. 7, figs. 27, 28, Miocene) the sutures are more strongly curved, the umbo more central and in edge view the end away from the aperture is produced.

Robulus pudibundus Israelsky n. sp.

Plate 14, figures 23, 24

Test lenticular; in side view subcircular, apertural end bluntly pointed with projecting apertural process, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands extraordinarily wide proportionately, tending to be slightly raised toward umbo, becoming more strongly reflexed with growth, tangent to umbo, meeting periphery at about 45 degrees, umbo central, height of chambers at periphery irregular, well defined keel on all chambers; in edge view subelliptical, produced at apertural end, greatest thickness through umbos, septal face broadly V-shaped, slightly depressed, bounded laterally by low rounded rims that merge into lateral surfaces of final chamber, apertural process subconoidal, aperture an elongate collared slit on final face of process, no striae noted.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	107	549009	0.34	0.33	0.19

The figure referred to *Cristellaria orbicularis* d'Orbigny by Plummer (1926, pl. 7, fig. 1, Eocene) is similar in side view but the sutural bands are less conspicuous and the outline has a slightly angulate appearance, also her specimen in edge view is proportionately thicker and has a proportionately thinner keel. Cushman (1951, pl. 5, fig. 3, Paleocene) repeats her figure but places it under *Robulus insulsus* Cushman (1951, pl. 5, figs. 1, 2, Paleocene), a very questionable assignment.

Cristellaria rotabilis Israelsky n. sp. is very similar in appearance but is more closely coiled, its sutural bands tend to narrow from the umbo toward the periphery, the final face is much more elongate and depressed and no robuline aperture was noted.

Robulus tumeyensis Israelsky n. sp.

Plate 14, figures 25, 26

Test lenticular; in side view subcircular, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures covered by ridges, earlier ones reflexed, comma-shaped, later ones nearly straight, all tangent to umbo and meeting periphery at about 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, strongly produced at end away from aperture, greatest thickness through umbos, septal face broadly V-shaped, depressed, weakly concave, bounded laterally by low inwardly beveled rims, apertural process subconoidal with weak radial striae terminally, aperture an elliptical collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	77	549010	0.70	0.65	0.43

Robulus pseudovortex Cole (1927, pl. 1, fig. 12, side view only, Eocene—Cushman and McMasters (1936, pl. 74, figs. 1, 2, Eocene) although very similar lacks the

comma-shaped early sutural ridges and the straightened later sutures.

Cristellaria laticostata Tutkowski (1888, pl. 5, fig. 2, Eocene) in addition to the above distinctions has more eccentric umbos.

Robulus chambersi Garrett (1939, pl. 65, figs. 8, 9, Oligocene) agrees in the straightening of the later sutural ridges but lacks the comma-like early sutural ridges and the apertural opening is much more elongate.

Robulus globangulata Israelsky n. sp.

Plate 14, figures 27, 28

Test lenticular; in side view crudely subcircular or roundly angulate, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural ridges weakly raised, almost straight, tangential to umbo, irregularly meeting periphery at from about 30 to nearly 45 degrees due to irregular curvature of periphery, umbo central, height of chambers at periphery irregular, well-defined thick rim on all chambers; in edge view subelliptical, weakly produced at either end, greatest thickness through umbos, septal face elongate heart-shaped, depressed, bounded laterally by low rims; apertural process subconoidal, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	67	549011	0.27	0.27	0.14

Robulus melvilli Cushman and Renz (1941, pl. 2, fig. 12, Miocene) has a somewhat similar outline but is much more compressed and the aperture is described as "radiate with a round opening below on the upper end of the apertural face."

Robulus sp. AI

Plate 14, figures 29, 30

In side view subovate, periphery straightened in places, the straightened portions each involving portions of two chambers and giving an angulate appearance, final margin of last chamber merging with periphery of earliest visible chamber without offset, sutural bands strongly reflexed, meeting periphery at about 45 degrees, all tangent to umbo, umbo subcentral, height of chambers at periphery irregular, well-defined thick rim on all chambers; in edge view subelliptical, slightly produced at either end, greatest thickness through umbos, septal face heart-shaped, about as wide as long, strongly depressed, bounded laterally by well-formed ridges, apertural process inconspicuous, subconoidal; aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	66	549012	0.25	0.24	0.15

The apertural area is broken in the figured specimen, but it is believed that a portion of the collar can be detected.

Robulus? sp. AJ

Plate 14, figures 31, 32

In side view subovate, apertural end broadly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures slightly raised, gently reflexed, tangential to umbo, meeting periphery at about 45 degrees, umbo slightly eccentric, height of chambers at periphery irregular, well-defined thin keel on all chambers; in edge view subelliptical, strongly produced at end away from aperture, greatest thickness through flattened umbos, septal face broadly heart-shaped, bounded laterally by low rims; apertural process subconoidal, terminated with stellate ridges, the aperture probably a subelliptical collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	68	549013	0.53	0.48	0.33

The preservation is such that the presence of a robuline aperture is uncertain. The two strongly developed elongate ridges running toward the final face strongly support the probability of such an aperture.

Robulus sp. AK

Plate 14, figures 33, 34

Test lenticular; in side view subcircular, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, tangential to umbo, meeting periphery at about 45 degrees, umbo somewhat eccentric, height of chambers at periphery increasing regularly, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, slightly depressed, bounded laterally by low rounded rims which blend into lateral surfaces of final chamber; apertural process subconoidal, aperture a subelliptical collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	78	549104	0.29	0.28	0.19

Robulus sp. AL

Plate 14, figures 35, 36

Test lenticular; in side view subcircular, apertural end obtusely pointed, opposite end rounded, final mar-

gin of last chamber and periphery of earliest visible chamber meeting in a high obtuse angle, sutural bands very weakly raised, reflexed, tangent to umbo, meeting periphery at about 45 degrees, last two sutures notably overlapping previous ones, umbo subcentral, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face elongate heart-shaped, concave, bounded laterally by rounded rims; apertural process inconspicuous, toothed in side view, aperture an elliptical collared opening on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	87	549015	0.58	0.53	0.33

The chamber plan is much like that of *Cristellaria clericii* Fornasini (1895, p. 65, fig. 17, Neogene) but that species has a sinuous final margin of last chamber which meets the periphery of the earliest visible chamber in a much lower angle and it also lacks a well-defined keel. A figure referred to *Robulus clericii* (Fornasini) by Stainforth (1948, pl. 24, fig. 1, side view only, Oligocene) may possibly be identical with the specimen from the Lodo formation. In his text (p. 131) Stainforth states "occasional specimens * * * are known in the late Middle and Upper Eocene."

Robulus submissus Israelsky n. sp.

Plate 14, figures 37, 38

Test lenticular; in side view subcircular, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming a low obtuse angle, sutures flush, tangent to umbo, meeting periphery at about 45 degrees, umbo subcentral, somewhat thickened, height of chambers at periphery irregular, rim well defined on last chamber only; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos, septal face broadly V-shaped, concave, bounded laterally by rounded rims that blend into lateral surfaces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	105	549016	0.27	0.24	0.16

Schlicht's (1870, pl. 19, figs. 1, 2, Oligocene) unnamed figures which were referred to *Cristellaria umbonata* Reuss (1870, p. 482, Oligocene) shows straighter sutures and lacks a prominent apertural process.

The form referred to *Robulus duracina* (Stache) by Galloway and Morrey (1929, pl. 15, fig. 13, Eocene) is is similar in side view, but in edge view is much less swollen through the umbos, has a more truly heart-shaped final face and a circular rather than an elongate aperture.

Robulus intusvortex Bermudez (1949, pl. 7, figs. 25, 26, Oligocene) has more strongly reflexed sutures, apparently no rim and is proportionally thinner than the present species.

Robulus ruinosus Israelsky n. sp.

Plate 14, figures 39, 40

Test lenticular; in side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, all except last radiating from umbo, reflexed and meeting periphery irregularly at angles of from about 45 to nearly 60 degrees, final suture tangential to umbo, nearly straight, meeting periphery at about 60 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, keel produced at end away from aperture, greatest thickness through umbos, septal face broadly V-shaped, flattened, bounded by flush rims which round into lateral faces of final chamber; apertural process subconoidal, aperture a subelliptical collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	104	549017	0.37	0.35	0.21

Robulus? sp. AN

Plate 14, figures 41, 42

Test lenticular; in side view, apertural end acutely pointed, oposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, varying irregularly from tangent to radiate from umbo, irregularly meeting periphery at angle of from about 45 degrees to nearly 90 degrees, umbo central, height of chambers at periphery irregular, well defined rim on all chambers; in edge view subelliptical, somewhat compressed, greatest thickness through umbos, septal face trigonally heart-shaped, flattened, rounding into lateral faces of final chamber without well defined rim; apertural process subconoidal, apertural area broken.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	12	549018	0.30	0.26	0.14

The specimen figured by Egger (1907, pl. 2, figs. 14, 15, Cretaceous) as *Cristellaria* (*Robulina*) *münsteri* Römer has some resemblance, but all sutures are more strongly curved, the test is less tightly coiled and proportionately less compressed.

Robulus sp. AO

Plate 14, figures 43, 44

Test lenticular; in side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, periphery tending to straighten irregularly giving a weakly subangulate appearance, sutures poorly visible, all apparently tangent to umbo, all except last meeting periphery at about 45 degrees, the last at nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, poorly defined rim present; in edge view subelliptical, greatest thickness through umbos, septal face broadly V-shaped, concave bounded laterally by inwardly bevelled ridges; apertural process subconoidal, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	12	549019	0.49	0.45	0.26

Lenticulina frankei Marie (1941, pl. 9, fig. 105, Cretaceous) has a very similar appearance but is described as being noncarinate.

Robulus usitatus Israelsky n. sp.

Plate 14, figures 45, 46

Test lenticular; in side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming a low obtuse angle, sutures flush, gently reflexed, radiate from umbo, meeting periphery irregularly at angles of from about 45 to nearly 90 degrees, umbo slightly excentric, height of chambers at periphery irregular, well-defined broad thin keel on all chambers; in edge view subelliptical, produced at either end, greatest thickness through umbos, septal face broadly V-shaped, slightly depressed, bounded laterally by low rims; apertural process subconoidal, compressed, aperture an elongate slit bounded by flaplike lips, lying in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	104	549020	0.50	0.43	0.25

Robulus sp. AM may be distinguished by its proportionately greater width, its narrower apertural process and the tangential final suture; *Robulus morsus* Israelsky n. sp. by its tangential sutures; and *Robulus* sp. AP by its greatest thickness being through the final chamber rather than through the umbos.

Robulus morsus Israelsky n. sp.

Plate 14, figures 47, 48

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin and periphery of earliest visible chamber forming an obtuse angle, sutural bands gently reflexed, tangential to umbo, meeting periphery irregularly at angles from about 45 to 90 degrees, umbo slightly eccentric, height of chambers at periphery increasing regularly, well-defined broad keel on all chambers except last; in edge view subelliptical, somewhat produced at either end, greatest thickness through umbos, septal face heart-shaped, slightly depressed, bounded laterally by low rounded rims; apertural process subconoidal, strongly compressed, aperture a small subcircular opening with U-shaped collar which opens onto the final face.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	18	549021	0.54	0.48	0.28

A specimen figured by Bandy (1949, pl. 8, fig. 1, Eocene) as *Robulus alato-limbatus* Gümbel is close, but has less tangential sutures, a proportionately thinner and narrower keel and is more tightly coiled.

Robulus usitatus Israelsky n. sp. which has much the same outline may be distinguished readily by its radiate sutures.

Several specimens labeled "*Robulus antipodum* Stache (Cushman Coll. 24089), Eocene, Poway Conglomerate, Murray Canyon, La Jolla Quad., Calif." show more strongly curved sutures, a more open septal face, are more tightly coiled and lack attenuation in edge view.

Robulus sp. AP

Plate 14, figures 49, 50

Test lenticular; in side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutural bands except last flush, last slightly depressed with corresponding slight swelling of final chamber, all reflexed, early sutures meeting periphery at about 45 degrees, later at nearly 60 degrees, umbo very eccentric, height of chambers at periphery apparently increasing regularly, well-defined wide thin keel on all chambers; in edge view subelliptical, strongly produced at either end, greatest thickness through final chamber, septal face elongate heart-shaped, depressed, bounded laterally by rounded rims which merge into lateral faces of final chamber; apertural process subconoidal, compressed, aperture, a subelliptical collared opening on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	6+1′	549022	0.79	0.71	0.38

Lenticulina rotulata Lamarck as figured by Cushman (1941, pl. 16, fig. 13, side view only, Cretaceous) appears similar but the umbo is less eccentric and Cush-

man's assignment of the form to *Lenticulina* implies absence of a robuline slit.

In edge view a figure referred to *Robulus stephensoni* Cushman by Cushman (1946, pl. 18, fig. 13, not 12, the holotype, Cretaceous) from the Saratoga chalk of Arkansas is similar in having flattened sides but is proportionally thinner and the sutures are less reflexed and more numerous.

Robulus requietus Israelsky n. sp.

Plate 14, figures 51, 52

Test lenticular; in side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, varying from radiate to somewhat tangent to umbo, irregularly meeting periphery at from about 45 to nearly 90 degrees, umbo somewhat eccentric, height of chambers at periphery increasing regularly, well-defined keel present on all chambers; in edge view subelliptical, strongly produced at either end, strongly compressed through the umbonal area, greatest thickness through umbos, septal face U-shaped, depressed; apertural process subconoidal, aperture an elliptical opening within greatly thickened collar, the collar forming the final face of the process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	98	549023	0.46	0.43	0.26

Robulus mediocris Israelsky n. sp.

Plate 14, figures 53, 54

Test lenticular; in side view subcircular, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, tangent to umbo, meeting periphery irregularly at angles of from about 45 degrees to nearly 60 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined broad thin keel on all chambers; in edge view subelliptical, produced at either end, greatest thickness through umbos, septal face proportionally small, broadly V-shaped, depressed, bounded laterally by low rims which round into the lateral faces of the final chamber; apertural process subconoidal, compressed, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	107	549024	0.53	0.50	0.18

Robulus sp. F of Leroy (1944a, pl. 4, figs. 19, 20, Miocene) is somewhat similar but appears to have a narrow thick rim, more prominent umbos and is proportionately thicker.

Robulus sp. AQ

Plate 15, figures 1, 2

In side view subovate, somewhat angulate, apertural end acutely pointed, opposite end roundly angulate, final margin of last chamber gently bowed and meeting periphery of earliest visible chamber in an obtuse angle, periphery angling without regard to sutures, sutural bands flush, almost straight, except last which is sinuous and somewhat comma-shaped, all tangent to umbo and all except last meeting periphery at nearly 45 degrees, last at a somewhat higher angle, umbo subcentral, height of chambers at periphery irregular, thin keel present on all chambers; in edge view subelliptical, somewhat produced at either end, greatest thickness through umbos, septal face heart-shaped with long lobes, flattened; apertural process subconoidal, strongly compressed, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	68	549025	0.38	0.33	0.18

Robulus revolutus Israelsky n. sp.

Plate 15, figures 3–6

Test lenticular; in side view subcircular, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, tangential to umbo, meeting periphery at about 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined keel present on all chambers; in edge view subelliptical with keel projecting, greatest thickness through umbos, septal face broadly V-shaped, slightly depressed, bounded laterally by low rounded rims; apertural process subconoidal, aperture of subelliptical collared opening in the final face of the process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	549026	0.38	0.35	0.19
Paratype	6+1′	549027	.66	.65	.33

Robulus arcuato-striatus (Hantken) var. *carolinianus* Cushman (1933, pl. 1, fig. 9, Eocene) has a more eccentric umbo and slightly raised sutures which are more strongly bent near the umbo than in *Robulus revolutus* Israelsky n. sp.

The specimen referred to *Robulus pseudocultratus* Cole by Bandy (1951, pl. 72, fig. 5, Cretaceous) is very similar in side view but is proportionally thinner and has a different apertural process than does *Robulus revolutus* Israelsky n. sp.

Robulus prosperus Israelsky n. sp.

Plate 15, figures 7, 8

Test lenticular; in side view subcircular, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutural bands varying from flush to gently raised, most raised, gently reflexed, tangential to umbo, meeting periphery at about 45 degrees, umbo central, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos, septal face broadly V-shaped, gently depressd, bounded laterally by low ridges which round into the lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	103	549028	0.40	0.38	0.25

The figure referred to *Lenticulina rotulata* Lamarck by Cushman (1941, pl. 16, fig. 13, side view only, Cretaceous) is less tightly coiled, has a slightly more eccentric umbo, the final margin is more curved and presumably a robuline aperture is lacking.

This form may prove to be a variation of the following species, *Robulus mundialis* Israelsky n. sp., from which it differs essentially only in the better developed final face and proportionally thinner keel. However these differences appear consistent.

Robulus mundialis Israelsky n. sp.

Plate 15, figures 9, 10

Test lenticular; in edge view subcircular, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands slightly reflexed to nearly straight, tangential to umbo, meeting periphery at about 45 degrees, earlier sutures slightly raised, umbo central, height of chambers at periphery irregular, thin keel on all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos; septal face heart-shaped, subtriangular, depressed, bounded laterally by inwardly bevelled ridges, apertural process subconoidal, aperture an elongate collared slit in final face of process. The aperture is described from better preserved specimens.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	22	549029	1.18	1.13	0.70

The figure referred to *Lenticulina rotulata* Lamarck by Cushman (1941, pl. 16, fig. 13, side view only, Cretaceous) is less tightly coiled, has a slightly more eccentric umbo, the final margin is more curved and presumably a robuline aperture is lacking.

Loetterle's (1931, pl. 2, fig. 1, Cretaceous) version of *Lenticulina macrodisca* (Reuss) lacks a robuline aperture, the umbo is more eccentric and the final chamber is more produced than in *Robulus mundialis* Israelsky n. sp.

Robulus prosperus Israelsky n. sp. may be distinguished by its better developed final face and thicker keel.

Robulus sp. AR

Plate 15, figures 11, 12

In side view subovate, periphery of chambers indented at sutures giving scalloped appearance, keel not indented but tending to irregularly straighten with resulting subangulate outline, apertural end acutely pointed, opposite end somewhat straightened, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, final margin with a low rim, sutures gently depressed with resultant slight inflation of chambers, varying from gently reflexed to nearly straight, early sutures meeting periphery at about 45 degrees, later sutures at nearly 90 degrees, umbo eccentric, height of chambers at periphery increasing regularly, well-defined keel on all chambers; in edge view subelliptical with compressed sides, somewhat produced at either end, greatest thickness through umbos, final face broadly V-shaped, depressed, bounded laterally by rounded rims which merge into lateral faces of final chamber; apertural process subconoidal, strongly compressed, very prominent, several radial grooves detectible on lateral faces, aperture a comparatively large elliptical collared opening on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	72	549030	0.43	0.38	0.25

Robulus melvilli Cushman and Renz (1941, pl. 1, fig. 12, Miocene) and *Robulus adelinensis* Keijzer var. *nipeensis* Keijzer (1945, pl. 2, figs. 23, 24, Oligomiocene) are more angulate, chamber peripheries are less strongly scalloped, umbos are more central, and tests are less compressed through the umbos. The holotype of *Robulus melvilli* has flush sutures.

A specimen figured by Cushman (1946b, pl. 12, fig. 8, side view only, Eocene) as *Robulus cf. depauperatus* (Reuss) is related but the sutures are more strongly bent and the umbo more central.

Robulus sp. AS

Plate 15, figures 13, 14

Test lenticular; in side view subcircular, apertural end acutely pointed, opposite end rounded, final margin

of last chamber and periphery of earliest visible chamber forming a low obtuse angle, sutures with slightly raised ridges except the last, more strongly raised in early sutures, the last suture depressed with corresponding slight swelling of the final chamber, sutures gently reflexed, radiate from umbo, earlier sutures meeting the periphery at about 45 degrees, later sutures at nearly 90 degrees, umbo subcentral, slightly eccentric, strongly swollen, height of chambers at periphery in general increasing regularly, well-defined broad thin keel on all chambers; in edge view subelliptical, weakly diamond-shaped, produced toward either end, more strongly in end away from aperture, greatest thickness through umbos, septal face broadly V-shaped, very constricted, slightly depressed, bounded laterally by low rounded rims; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	74	549031	0.95	0.93	0.41

This form is related to that figured as *Robulus navaroensis* (Plummer) by Cushman (1946, pl. 16, figs. 6–8, especially 8, side views only, Cretaceous) which in two figures show depressed sutures late in the growth of the test. In Cushman's figures the umbos are more central, the sutures more bent near the periphery and the sutures are somewhat commalike, broadest toward the umbo.

In the original figure of *Cristellaria navaroensis* Plummer (1926, p. 40, text fig. 4, Cretaceous) the umbos appear to be flush.

In *Cristellaria midwayensis* Plummer (1926, pl. 13, fig. 5, Eocene), refigured by Cushman (1951, pl. 3, figs. 14, 15, Paleocene) as *Robulus midwayensis* (Plummer) and *Cristellaria midwayensis* Plummer var. *carinata* Plummer (1926, p. 41, text figure 5, Eocene) refigured by Cushman (1951, pl. 3, fig. 18, Paleocene) the sutural ridges are somewhat comma-shaped and touch the periphery at nearly 45 degrees throughout, the septal faces are proportionally larger, the tests proportionally thicker and the umbo is not swollen.

Also similar is *Cristellaria secans* Reuss (1860, pl. 9, fig. 7, Cretaceous) but that form appears less tightly coiled, has a less well defined keel and is less swollen through the umbos.

Robulus? sp. AT differs by having tangential sutures.

Robulus? sp. AT

Plate 15, figures 15–18

Test lenticular; in side view subcircular, apertural end actuely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, gently reflexed except last which is sometimes nearly straight, tangential to umbo, meeting periphery at about 45 degrees except occasionally the last which may approach 90 degrees, umbo central, slightly swollen, height of chambers at periphery irregular, well-defined broad thin keel on all chambers; in edge view subelliptical, somewhat diamond shaped, greatest thickness through the swollen umbos, septal face V-shaped, depressed, bounded laterally by sharp inwardly beveled ridges, aperture broken away in available specimens but probably robuline. The length of USNM 549033 is estimated.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	45	549032	2.28	2.15	0.86
Figured	010+1′	549033	1.25	1.15	.50

The comparisons made for *Robulus* sp. AS in contrasting with *Robulus navaroensis* Plummer and *Robulus midwayensis* Plummer apply equally well here.

Robulus sp. AU

Plate 15, figures 19, 20

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, tangent to umbo, meeting periphery irregularly at angles of about 45 and 60 degrees, umbo subcentral, height of chamber at periphery increasingly regularly, well-defined rim on all chambers; in edge view subelliptical, weakly produced at apertural end, strongly produced at opposite end, greatest thickness through umbos; septal face heart-shaped, subtrigonal, slightly depressed, bounded laterally by low rounded rims which merge into lateral faces of last chamber; apertural process subconoidal, compressed, aperture a subelliptical collared opening in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	103	549034	0.30	0.25	0.18

Robulus sp. AV

Plate 15, figures 21, 22

In side view subovate, roundly subquadrangular, apertural end acutely pointed, opposite end angulately rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, periphery in early portion regularly curved, thereafter tending to irregularly straighten without regard to chamber boundaries, sutures flush, gently reflexed, radial from umbo, meeting periphery irregularly at from about 45 to nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, rim present

but poorly defined on later chambers; in edge view subelliptical, greatest thickness through umbo, final face heart-shaped, weakly bounded laterally by low rims; apertural process subconoidal, radial grooves on sides, aperture a triangular opening in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	101–1′	549035	0.48	0.38	0.28

Robulus sp. AW

Plate 15, figures 23, 24

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, gently reflexed, tangent to umbo, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery increasing regularly, rim poorly defined except on early portion of periphery; in edge view subelliptical, rim projecting, greatest thickness through umbos, septal face subtrigonal, slightly depressed, bounded laterally by low rounded rims which merge into lateral faces of final chamber; apertural process subconoidal, aperture a subelliptical opening on final face of process, widest toward periphery, enclosed by liplike collar.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	105	549036	0.30	0.25	0.23

Robulus sp. AX

Plate 15, figures 25, 26

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a low obtuse angle, sutures flush, gently reflexed, tangential to umbo, meeting periphery irregularly at from about 45 to nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, weak suggestion only of rim; in edge view subelliptical, greatest thickness through umbos, septal face broadly V-shaped, weakly depressed, bounded laterally by low rounded rims; apertural process subconoidal, aperture a trigonal opening with lips on either side in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figures	105	549037	0.29	0.25	0.20

Robulus alexanderi Sandige as figured by Cushman (1941, pl. 15, fig. 15, Cretaceous) is similar in outline and chamber form but is proportionately much thinner and appears to have a slitlike aperture. The same remarks apply to *Robulina depauperata* Reuss (1851a, pl. 4, fig. 29, Oligocene).

Robulus sp. AY

Plate 15, figures 27, 28

In side view subovate, apertural end bluntly pointed, opposite end rounded, margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, tangential to umbo, earliest visible suture strongly reflexed, each successive suture less so, sutures meeting periphery at about 45 degrees except last which meets at nearly 90 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, well-defined rim on periphery of all chambers; in edge view subelliptical, somewhat produced at either end, greatest thickness through umbos, septal face elongate, heart-shaped, depressed, bounded laterally by narrow rims; apertural process subconoidal with radial grooves on sides, aperture apparently a semicircular opening in the final face of process bounded by U-shaped collar which opens on the final face of the test.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	83	549038	0.23	0.19	0.12

A specimen figured by Cushman and Todd (1945b, pl. 13, fig. 25, side view only, Eocene) as *Robulus* cf. *alatolimbatus* (Gümbel) is in close agreement but the offset between the final margin of the last chamber and the periphery of the earliest chamber is much more marked.

Robulus sp. AZ

Plate 15, figures 29, 30

In side view subovate, apertural end obtusely pointed, opposite end rounded, final margin meeting periphery of first visible chamber in an obtuse angle, sutural bands flush, tangent to umbo, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined rim on periphery of all chambers; in edge view subelliptical, weakly produced at apertural end, strongly produced at opposite end, greatest thickness through umbos, septal face trigonally heart-shaped, depressed, bounded laterally by rounded rims; apertural process subconoidal with radial striae on sides, aperture an elongate opening in final face of process, widest toward terminus, bounded by U-shaped rim which opens onto septal face of test.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	104	549039	0.33	0.29	0.24

Robulus sp. BA

Plate 15, figures 31, 32

In side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse

angle, sutures flush to weakly raised, comma-shaped, radiate from umbo, earliest visible suture meeting periphery at about 30 degrees, others at nearly 60 degrees, umbo slightly eccentric, height of chambers at periphery irregular, narrow thin keel on all chambers; in edge view subelliptical, strongly produced at end away from aperture, greatest thickness through umbos, septal face heart-shaped, very weakly convex, bounded laterally by weak rims; apertural process subconoidal, aperture an elongate collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	71	549040	0.50	0.44	0.23

In side view there is resemblance to *Robulus dissimilis* Bermudez (1949, pl. 7, figs. 15, 16, Oligocene) but that species has distinctly raised and partly beaded sutures and is proportionately much thinner through the umbos.

The specimen figured as *Robulus alato-limbatus* (Gümbel) by Cushman and Todd (1945a, pl. 3, fig. 11, side view only, Eocene) is similar but the sutures appear quite flush and less strongly reflexed.

Robulus nobilitatus Israelsky n. sp.

Plate 15, figures 33, 34

In side view subovate, strongly rounded, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures very gently reflexed, all except last flush, the last gently depressed, earlier visible sutures meeting periphery at about 45 degrees, later at nearly 90 degrees, earliest sutures somewhat tangent to umbo, later radiate, umbo subcentral, distinct, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, greatest thickness through umbos, last chamber showing some inflation, septal face flattened, without well-defined rims; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	18	549041	0.60	0.53	0.27

The figure referred to *Robulus alato-limbatus* (Gümbel) by Cole (1927, pl. 4, fig. 1, side view only, Eocene) is more tightly coiled and all sutures appear radiate.

In other American references to the same species sutures all appear more tangential than in either Cole's figure or the present species.

Robulus sp. BB

Plate 15, figures 35, 36

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, straight, tangential to umbo, inclined rearwards, meeting periphery at about 45 degrees or a higher angle, umbo subcentral, height of chambers at periphery irregular, well-defined thin keel on all chambers; in edge view subelliptical, weakly produced at either end, septal face broadly V-shaped, depressed, bounded laterally by rounded ridges which grade into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	69	549042	0.40	0.38	0.22

The specimen figured by Cushman and Simonson (1944, pl. 30, fig. 7, side view only, Oligocene) as *Robulus articulatus texanus* (Cushman and Applin) has a somewhat similar outline but is more loosely coiled and the sutures are less tangential.

Robulus fictus Israelsky n. sp.

Plate 15, figures 37, 38

In side view subovate, apertural end acutely pointed, opposite end angulately rounded, periphery irregularly straightening without regard to chamber boundaries, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, sutural bands flush, earlier ones radial, later ones tangent, meeting periphery irregularly at from about 45 to nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, greatest thickness through umbo, septal face heart-shaped, depressed, bounded laterally by rounded rims; apertural process subconoidal, aperture a short collared elliptical opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	80	549043	0.24	0.22	0.13

Robulus odiosus Israelsky n. sp. has more strongly reflexed sutural bands which are all tangential to the umbo.

Robulus jocosus Israelsky n. sp.

Plate 15, figures 39, 40

In side view subovate, apertural end acutely pointed, opposite end angulately rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, early part of periphery regularly rounded, remainder irregularly angulate with straightened segments that disregard chamber boundaries, sutures flush, irregularly varying from radiate to tangential to umbo, meeting periphery at about 45 degrees, umbo subcentral, prominent, height of chambers

at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, somewhat produced at either end, greatest thickness through umbos, septal face heart-shaped, depressed, bounded laterally by rounded rims which merge into the lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate collared slit on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	81	549044	0.23	0.21	0.13

Robulus sp. BC

Plate 15, figures 41, 42

Test lenticular; in side view subovate, apertural end bluntly pointed, opposite end rounded, approximately last half of periphery weakly angulate, angulations not necessarily corresponding to chamber boundaries, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, slightly reflexed to almost straight, tangent to umbo, meeting periphery at nearly 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, very constricted, shallowly concave and rounding into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	48	549045	0.65	0.60	0.36

This form differs notably from the preceding species, *Robulus jocosus* Israelsky n. sp., in its consistently tangential sutures, very restricted final face and lack of attenuation at either end.

Robulus sp. BD

Plate 15, figures 43, 44

In side view subovate, apertural end acutely pointed, opposite end rounded, margin and periphery of earliest visible chamber forming an obtuse angle, periphery of final chamber somewhat straightened giving a weakly angulate appearance, sutural bands flush, gently reflexed, tangential to umbo, earlier sutures meeting periphery at about 60 degrees, last at nearly 45 degrees, umbo very eccentric, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, subtriangular, depressed, bounded laterally by inwardly beveled ridges; aperture an elliptical collared opening on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	68	549046	0.20	0.17	0.13

Robulus sp. BE

Plate 15, figures 45, 46

In side view subovate, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, periphery of last two chambers angulate between sutures, earliest visible sutural band raised, intermediate bands flush, last weakly depressed, tangential to umbo, earlier sutures meeting periphery at about 45 degrees, later at nearly 60 degrees, umbo somewhat eccentric, height of chambers at periphery irregular well-defined rim on all chambers; in edge view subelliptical, weakly produced at end away from aperture, greatest thickness through umbos, septal face broadly heart-shaped, depressed, bounded laterally by inwardly beveled rims; apertural process subconoidal, radial striae present terminally, aperture a comparatively broad collared elliptical opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	22	549047	0.93	0.83	0.55

Robulus knighti Toulmin (1941, pl. 78, fig. 21, text fig. 2c, Eocene) has a similar outline but all the sutures are flush.

Robulus sp. BF

Plate 16, figures 1, 2

Test lenticular; in side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, sutures flush, gently reflexed, tangent to umbo, meeting periphery at about 45 degrees, umbo slightly eccentric, height of chambers at periphery increasing regularly, well-defined keel on all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos, septal face V-shaped, concave, bounded laterally by inwardly beveled rims; apertural process subconoidal, radially striate at apex, aperture an elongate collared opening on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	6+1′	549048	0.93	0.82	0.48

Cristellaria cf. *gaultina* Berthelin of Cushman (1926, pl. 19, fig. 12, side view only, Cretaceous) is proportionally thinner and has a flatly convex, more trigonal septal face.

Specimens in the U. S. National Museum labeled as topotypes of *Robulina inornata* d'Orbigny (1846, pl. 4, figs. 25, 26 Miocene) are very similar in side view but

their septal faces are more triangular and simply depressed rather than concave.

Robulus infortunatus Israelsky n. sp.

Plate 16, figures 3, 4

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a very high obtuse angle, sutural bands flush, gently reflexed, tangential to umbos, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined thick rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face elongate heart-shaped, depressed, bounded laterally by low rounded rims; apertural process subconoidal, aperture an elongate collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	100	549049	0.55	0.50	0.35

This species lacks the somewhat angulate periphery of *Robulus* sp. BH.

Robulus sp. BG

Plate 16, figures 5, 6

In side view subovate, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, periphery of both chambers and rim tending to irregularly straighten resulting in a weakly subangulate outline, sutures flush, tangential to umbo, all except last meeting periphery at about 45 degrees, the last at almost 90 degrees, umbo subcentral, height of chambers at periphery increasing irregularly, well-defined thick keel on all chambers; in edge view broadly subelliptical, greatest thickness through umbos, slightly produced at either end, septal face broadly heart-shaped, depressed, bounded laterally by inwardly beveled ridges; apertural process subconoidal, the aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	103	549050	0.38	0.35	0.22

The figured specimen and several others exhibit a departure from true planispiral growth.

Robulus sp. BH

Plate 16, figures 7, 8

In side view subovate, suboblate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutural bands flush, tangent to umbo, earlier ones strongly reflexed, penultimate one gently reflexed, final suture nearly straight, reflexed sutures meeting periphery at about 45 degrees, final suture at nearly 90 degrees, umbo very eccentric, height of chambers at periphery irregular, well-defined thick rim on all chambers; in edge view subelliptical, somewhat produced at end away from aperture, greatest thickness through umbos, septal face heart-shaped, depressed, bounded laterally by broad rounded rims; apertural process subconoidal, aperture an elliptical collared opening in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	81	549051	0.30	0.26	0.18

In contrast *Robulus infortunatus* Israelsky n. sp. has a smoothly curved periphery and proportionally longer septal face.

Robulus sp. BI

Plate 16, figures 9, 10

In side view subovate, obtusely pointed at apertural end, rounded on opposite end, periphery weakly angulate due to straightening on last two chambers, final margin of last chamber angulate, meeting periphery of earliest visible chamber in a low obtuse angle, sutures flush, tangential to umbo and meeting periphery at nearly 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined thick rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face broadly heart-shaped, depressed, bounded laterally by rounded rims; apertural process subconoidal, aperture a roundly triangular collared opening in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	104	549052	0.28	0.25	0.18

Robulus latexpandus Israelsky n. sp.

Plate 16, figures 11, 12

In edge view subovate, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, apertural process prominently projecting, broad sutural bands gently reflexed, tangential to umbo, meeting periphery irregularly from about 45 degrees to nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, produced at end away from aperture, greatest thickness through umbos, septal face triangularly heart-shaped, bounded laterally by rounded rims; apertural process subconoidal, strongly compressed, aperture an elongate collared slit on the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	110–1′	549053	0.48	0.41	0.28

This form may be distinguished from *Robulus comis* Israelsky n. sp. by its less strongly tangential and proportionately broader sutures, narrower aperture and less elliptical outline in side view.

Robulus coloratus (Stache) of Cushman (1953a, pl. 1, fig. 8, Recent) is somewhat similar in outline but the sutures are not banded, the umbos are more eccentric and the thickness is proportionately less.

Robulus midwayensis (Plummer) var. *virginianus* Shifflet (1948, pl. 1, fig. 16, side view only, not fig. 15, Eocene) is similar in side view but the sutures are described as raised and the chambers are more numerous. Two forms seem confused by that author, the smaller specimen (her fig. 16.) being considered the young of the larger (her fig. 15.). The larger specimen is more tightly coiled and has fewer chambers than the smaller, which is contrary to our usual experience.

Robulus comis Israelsky n. sp.

Plate 16, figures 13, 14

In side view subovate, apertural end obtusely pointed, apertural process strongly projecting, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutural bands flush, gently reflexed, strongly tangential to umbo, meeting periphery at about 45 degrees except the last at nearly 60 degrees, umbo slightly eccentric, height of chambers at periphery irregular, well defined keel on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, depressed, bounded laterally by inwardly beveled ridges; apertural process subconoidal, aperture an elongate opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	61	549054	0.58	0.54	0.35

Robulus comis Israelsky n. sp. is distinguished from *Robulus lattexpandus* Israelsky n. sp. by its more tangential sutures, proportionally narrower sutural bands, more open aperture and its more gibbose outline in edge view. It may eventually be demonstrated that *R. comis* is a variety of *R. latexpandus*, but satisfactory intergradation was not made with the available specimens.

Robulus adelinensis Keijzer var. *nipeensis* Keijzer (1945, pl. 2, figs. 24, 25, Oligomiocene) has a similar appearance but a tendency towards angularity of outline with scalloping in later chambers.

Robulus sp. BJ

Plate 16, figures 15, 16

In side view subcircular, apertural end obtusely pointed, opposite end rounded, final margin of last chamber sinuous, meeting periphery of earliest visible chamber in a high obtuse angle, sutures gently reflexed, first and third visible sutures raised, others flush, all tangential to umbo and meeting periphery at about 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined keel on periphery of all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos, septal face V-shaped, concavely depressed, bounded laterally by inwardly beveled ridges; apertural process flush with periphery, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	104	549055	1.28	1.15	0.63

Robulus gyroscalprum (Stache) as figured by Dorreen (1948, pl. 37, fig. 1, Eocene) is very closely related but is proportionally thicker and has a more conspicuous apertural process.

Robulus paucicameratus Israelsky n. sp.

Plate 16, figures 17, 18

In side view subovate, apertural end obtusely pointed, opposite end rounded, final margin of last chamber with slightly raised rim which extends onto first visible chamber, final margin and periphery of first visible chamber forming an obtuse angle, sutural ridges raised, comma-shaped, broadest toward umbo, not reaching to keel, radiate to umbo, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined keel on periphery of all chambers; in edge view subelliptical, strongly produced at end away from aperture, greatest thickness through umbo, septal face heart-shaped, depressed, very constricted, bounded laterally by inwardly beveled rims; apertural process subconoidal, inconspicuous, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	110–1′	549056	0.83	0.73	0.53

The apertural region is imperfect in the figured specimen but a specimen in sample 77 shows the aperture as described. Other specimens show more chambers.

Differs from *Robulus mysticus* Israelsky n. sp. notably in having radiate rather than tangential sutures.

Robulus proclivis Israelsky n. sp.

Plate 16, figures 19, 20

In side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutural bands flush, gently reflexed, meeting periphery at nearly 45 degrees, several radial grooves visible on apertural process, umbo subcentral,

height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, end away from aperture strongly produced, greatest thickness through umbo, septal face V-shaped, depressed, bounded laterally by inwardly beveled ridges; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	110–1′	549057	0.45	0.40	0.28

The nearest figure noted is that of *Robulus* aff. *submamilligera* (Cushman) of Leroy (1941 b, pl. 6, fig. 3, 4, Late Tertiary) but its sutures appear more strongly reflexed and the umbo more eccentric than in the present species.

Robulus mysticus Israelsky n. sp.

Plate 16, figures 21–24

In side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of first visible chamber meeting in an obtuse angle, sutural ridges weakly raised, comma-shaped, tangential to umbo, meeting periphery at about 45 degrees, umbo eccentric, well-defined keel on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face in adult elongate heart-shaped, gently concave, bounded laterally by inwardly beveled ridges, apertural process subconoidal, aperture a small elongate trigonal opening in final face of process.

The young form is proportionally thicker with only the earlier sutural ridges raised, the later slightly depressed, the umbo is less eccentric, the septal face broadly V-shaped and the beveled ridges proportionally narrower.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	92	549058	1.85	1.75	0.93
Paratype	100	549059	.53	.49	.33

The specimen figured by Cushman and McMasters (1936, pl. 74, fig. 12, Eocene) as *Robulus pseudovortex* Cole is similar but lacks the distinctly comma-shaped sutures of *Robulus mysticus* Israelsky n. sp., is not distinctly keeled and appears angulated on the last two chambers.

Robulus pseudovortex Cole (1927, pl. 1, fig. 12, side view only, Eocene) shows a form with sutural ridges broadest at the periphery.

Robulus sp. BK

Plate 16, figures 25, 26

In side view subovate, periphery of last two chambers weakly lobate, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures weakly raised, gently reflexed, tangent to umbo, meeting periphery at about 45 degrees, umbo slightly eccentric, height of chambers at periphery irregular, well-defined thick rim on all chambers; in edge view outline sagittate, produced at both ends, the end away from aperture strongly so, greatest thickness through the swollen umbos, septal face elongate subtrigonal, proportionally small, bounded laterally by rounded rims; apertural process subconoidal, radially striate on sides, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	92	549060	1.53	1.43	0.85

Robulus adelinensis Keijzer var. *nipeensis* Keijzer (1945, pl. 2, figs. 23, 24, Oligomiocene) is similar but has more central umbos, appears more tightly coiled and lacks sutural ridges.

Robulus absonus Israelsky n. sp.

Plate 16, figures 27, 28

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, gently reflexed, earlier sutures radiate, later tangential to umbo, sutures meeting periphery irregularly at from about 45 to nearly 90 degrees, slightly raised terminal ridge extending onto earlier chambers, umbo eccentric, height of chambers at periphery irregular, well-defined keel on all but last chamber; in edge view subelliptical, produced at end away from aperture, greatest thickness through umbos, septal face acutely heart-shaped, depressed, bounded laterally by weak rounded ridges that extend beyond final face onto early chambers; apertural process terminal, subconoidal, aperture a subtrianglar opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	104	549061	0.78	0.66	0.43

Robulus cf. *rosetta* (Gümbel) of Cushman and Renz (1942, pl. 1, fig. 4, Eocene) is very similar but its outline appears more angulate and the well-defined keel of the present form is lacking.

The original figures of *Robulina rosetta* Gümbel (1868, pl. 1, fig. 73, Eocene) have little resemblance to either the species from the Lodo formation or that figured by Cushman and Renz.

Robulus sp. BL

Plate 16, figures 29, 30

In side view subovate, roundly subquadrangular, straighter portions of the outline unrelated to cham-

bers, swelling on rim near final suture, apertural end acutely pointed, opposite end angulately rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, gently reflexed, earlier radiate from umbo, later tangential to umbo, irregularly meeting periphery at various angles of from about 45 to nearly 90 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, well-defined keel except on last chamber; in edge view subelliptical, slightly produced at either end, greatest thickness through umbos, septal face subtrigonal, proportionately small, slightly convex, rounding into lateral faces of final chamber; apertural process subconoidal, strongly compressed, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	12	549062	0.40	0.33	0.20

Robulus sp. BM

Plate 16, figures 31–34

In side view subovate, roundly angulate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, reflexed, tangential to umbo, meeting periphery at from about 45 to nearly 60 degrees due to irregular outline, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view broadly subelliptical, produced at either end, greatest thickness through umbos, septal face heart-shaped, much broader in the megalospheric (fig. 34) than in the microspheric (fig. 32) form, depressed, bounded laterally by broad rims; apertural process subconoidal, aperture a semielliptical opening bounded by a U-shaped collar which opens onto the septal face.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	110–1′	549063	0.30	0.25	0.20
Figured	110–1′	549064	.28	.23	.19

No very closely related figures were found. Perhaps the closest is *Cristellaria paucisepta* Sequenza (1880, pl. 13, fig. 13, Miocene) which is readily distinguished by its more closely coiled quadrangular outline.

Robulus supralodoensis Israelsky n. sp.

Plate 16, figures 35–40

Cristellaria inornata Cushman and G. D. Hanna, Calif. Acad. Sci. Proc., 4th ser., v. 16, p. 217, pl. 14, fig. 5, 1927 (Eocene). Not *Robulina inornata* d'Orbigny, Foss. Bass. Tert. Vienne, p. 102, pl. 4, figs. 25, 26, 1846 (Miocene).

Test lenticular; in side view subcircular, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of first visible chamber meeting in an obtuse angle, sutural bands flush except occasionally raised in earliest visible portions of test, gently reflexed, tangential to umbo, meeting periphery at about 45 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face V-shaped, very restricted, depressed, bounded laterally by inwardly beveled rims which round outwardly into the later faces of final chamber; apertural process subconoidal, compressed, aperture an elliptical opening on final face of process bounded on either side by a flaplike lip that together form an inwardly opening V; with growth, more abrupt increase of diameters than thickness.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	107	549065	0.79	0.63	0.40
Paratype	100	549066	1.40	1.30	.63
Paratype	100	549067	.61	.55	.38

Comparison with Cushman and Hanna's specimen showed it to be identical with the present species. D'Orbigny's figures show a more nearly circular outline, a central umbo, no rim and much less curve between umbo and periphery.

Cristellaria kemperi G. D. Hanna (1923, pl. 59, fig. 1, Eocene), *Cristellaria midwayensis* Plummer (1926, pl. 13, fig. 5, Eocene) and *Robulus dumblei* Weinzerl and Applin (1929, pl. 43, fig. 3, Eocene) all bear resemblance to *Robulus supralodoensis* Israelsky n. sp. but each has raised sutures and differs in other respects. Perhaps the closest figured form is *Robulus mellahensis* Nakkady var. *obesus* (1950, pl. 89, figs. 10, 11, Eocene) but it also has raised sutures, a proportionately much thinner rim and apparently an even more restricted septal face than *Robulus supralodoensis* Israelsky n. sp.

Robulus sp. BN

Plate 17, figures 1, 2

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, broad sutural bands flush, reflexed, first visible suture tangential to umbo, others radiate, sutures meeting periphery at about 45 degrees, umbo somewhat eccentric, height of chambers at periphery regularly increasing, well-defined keel on all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbo, septal face heart-shaped, flattened, rounding into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	90	549068	0.27	0.23	0.14

A three-chambered specimen (Cushman Coll. 9404), labeled as a topotype of *Robulus crassus* (d'Orbigny), resembles *Robulus* sp. BN but differs in having a smoothly curved periphery and proportionally narrower suture lines.

Robulus sp. BO

Plate 17, figures 3, 4

In side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, sutural bands flush, earlier sutures tangential to umbo, intermediate sutures radiate, final suture tangential to umbo, earlier sutures meeting periphery at about 45 degrees, later at nearly 60, umbo slightly eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, somewhat produced at end away from aperture, greatest thickness through umbos, septal face heart-shaped, concave, bounded laterally by inwardly beveled rims that round into the lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate slit bordered by flaplike lips in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	99	549069	0.67	0.58	0.37

The differences in the aperture and the irregular suture pattern in *Robulus* sp. BO serve to distinguish it from *Robulus* sp. BN.

Robulus turpis Israelsky n. sp.

Plate 17, figures 5–8

In side view oblately subelliptical, apertural end forming almost a right angle in the young, a low obtuse angle in the adult, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutural bands flush except the earlier sutures of the young, tangent to umbo, meeting periphery irregularly at various angles from about 45 to nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, poorly defined rim on all chambers; in edge view elliptical, greatest thickness through umbos, septal face subtrigonal in the young, heart-shaped in the adult, gently depressed, bounded laterally by low rims; apertural process subconoidal, aperture an elongate collared slit on final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	75	549070	0.74	0.65	0.41
Paratype	100	549071	.25	.22	.16

Robulus weaveri Beck (1943, pl. 103, figs. 3, 8, Eocene) is very similar and the present form may be but a variant of that species.

Robulus manifestus Israelsky n. sp.

Plate 17, figures 9, 10

Test lenticular; in side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, sutures flush, gently reflexed, radial from umbo, meeting periphery at about 90 degrees, umbo slightly eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbo, septal face very constricted, depressed, bounded laterally by rounded rims that merge into lateral faces of final chamber; apertural process subconoidal, aperture an elongate opening widening inwardly and bounded by flaplike lips.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	104	549072	0.54	0.48	0.28

Robulus aff. *ornatus* (d'Orbigny) of LeRoy (1944b, pl. 3, figs. 3, 4, Miocene) is similar in side view but the apertural process is less conspicuous, the umbo more central, the septal face less pinched and the thickness proportionately greater than in *Robulus manifestus* Israelsky n. sp.

Robulus arcanus Israelsky

Plate 17, figures 11, 12

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin and periphery of earliest visible chamber forming an obtuse angle, sutures flush, varying from gently reflexed to nearly straight, tangent to umbo except last (which is radiate), meeting periphery irregularly at from about 45 to nearly 90 degrees, umbo prominent, subcentral, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through somewhat swollen umbos, septal face heart-shaped, somewhat subtrigonal, depressed, bounded laterally by rounded rims that round into lateral faces of final chamber; apertural process subconoidal, aperture a narrow elliptical collared opening in the final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	72	549073	0.43	0.38	0.23

This form has tangential sutures, a more open septal face, and a more central umbo than *Robulus manifestus* Israelsky n. sp.

Robulus sp. F of LeRoy (1944, pt. 2, pl. 4, figs. 19, 20, Miocene) is similar but all sutures appear tangential to the umbo, the angle at which the sutures intersect the periphery increases regularly and the septal face is more V-shaped than in the Lodo species.

The specimen illustrated as *Cristellaria alato-limbata* (Gümbel) by Cushman and Applin (1926, pl. 8, fig. 8, Eocene) is more loosely coiled, the later sutures tend to be more strongly tangential, and the final suture is depressed.

Robulus habilis Israelsky n. sp.

Plate 17, figures 13, 14

Test lenticular; in side view subovate, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush except the last (which is slightly depressed), tangential to umbo, meeting periphery at about 45 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, in general later chambers lower than earlier ones, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face elongate heart-shaped, depressed, bounded laterally by inwardly beveled rims; apertural process subconoidal, aperture a trigonal opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	100	549074	0.85	0.75	0.44

Robulus euglypheus Bandy (1949, pl. 8, fig. 7, Eocene) has a more circular outline, more central umbos, and the early sutures appear more reflexed than in *Robulus habilis* Israelsky n. sp.

Robulus cumingii Michelotti as figured by Bornemann (1860, pl. 6, fig. 1, Tertiary) seems to be very similar but is closer coiled and more produced at end away from aperture, giving a more sagitate outline than in *Robulus habilis* Israelsky n. sp.

Robulus sp. BP

Plate 17, figures 15, 16

In side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, tangent to umbo, meeting periphery at about 45 degrees, umbo distinct, eccentric, height of chambers at periphery irregular, poorly defined rim on all chambers; in edge view subelliptical, strongly produced at end away from aperture, greatest thickness through umbos, septal face acutely heart-shaped, depressed, somewhat concave; apertural process subconoidal, aperture a subtrigonal opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	110–1′	549075	0.75	0.64	0.38

In each of the four available specimens the final chamber seems to be broken, but the figured and one other specimen show the subtrigonal aperture. One specimen shows terminal radiating striae.

Cristellaria glabra Perner (1892, pl. 5, figs. 1, 2, Cretaceous) has superficial resemblance only.

Robulus sp. BQ

Plate 17, figures 17, 18

In side view subovate, apertural end bluntly pointed, almost a right angle, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, strongly reflexed, somewhat comma-shaped, widest at umbos, sutures tangent to umbo, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, apertural end somewhat produced, greatest thickness through umbos, septal face heart-shaped, very restricted, slightly depressed, bounded laterally by low rounded rims which merge into lateral faces of final chamber, apertural process subconoidal, aperture an elongate collared slit on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	71	549076	0.21	0.16	0.13

Robulus sp. BR

Plate 17, figures 19, 20

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, early sutures radiate, later tangential to umbo, weakly reflexed, early and last meeting periphery at about 90 degrees, intermediate meeting periphery at nearly 45 degrees, umbo very eccentric, height of chambers at periphery increasing regularly, well-defined rim on all chambers; in edge view subelliptical, slightly produced at either end, septal face weakly heart-shaped, flattened; apertural process subconoidal with radial grooves on lateral faces, aperture a weakly collared elongate slit on the final face of process.

Specimen	Sample	USNM	*Dimensionsi n millimeters*		
			Length	Width	Thickness
Figured	83	549077	0.40	0.33	0.23

Robulus iracundus Israelsky n. sp.

Plate 17, figures 21, 22

Test lenticular; in side view subcircular, apertural end bluntly pointed, opposite end rounded, final margin and periphery of first visible chamber meeting in an obtuse angle, sutural bands flush except a few raised in earliest visible portions of test, gently reflexed, tangent to umbo, meeting periphery at about 45 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face heart-shaped, but slightly depressed, bounded laterally by low rims that round into lateral faces of final chamber; apertural process subconoidal, aperture an elliptical opening in final face of process bounded to either side by flaplike lips that form an inwardly opening V.

Specimen	Sample	USNM	*Dimensionsi n millimeters*		
			Length	Width	Thickness
Holotype	110–1′	549078	0.80	0.70	0.43

The much less rounded apertural end and the open septal face distinguish this species from *Robulus supralodoensis* n. sp.

Robulus inhabilis Israelsky n. sp.

Plate 17, figures 23, 24

Test lenticular; in side view subcircular, apertural end obtusely pointed, opposite end rounded, final margin and periphery of earliest chamber forming an obtuse angle, umbo somewhat eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face V-shaped, slightly depressed, bounded on either side by low rounded rims that blend into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	549079	0.78	0.73	0.45

Robulus sp. H (LeRoy 1944, pl. 5, figs. 45, 46, Miocene) is similar but seems to have more strongly reflexed sutures, a more sharply pointed apertural end, a more sunken septal face, and is proportionately thinner than *Robulus inhabilis* Israelsky, n. sp.

In side view *Robulus inhabilis* Israelsky n. sp. resembles topotypes of *Robulina inornata* d'Orbigny (1846, pl. 4, figs. 25, 26, Miocene) in the U. S. National Museum collections, but the umbos in those specimens are more central and the sutures straighter. The topotypes are proportionately much thicker than is indicated by the type figure.

Robulus fatigatus Israelsky n. sp.

Plate 17, figures 25, 26

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, tangent to umbo, earlier sutures meeting periphery at about 45 degrees, the last at almost right angles, early sutures strongly reflexed, later gently reflexed, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, slightly produced at either end, greatest thickness through the umbos, septal face heart-shaped, slightly convex, almost flat, rounding imperceptibly into lateral faces of last chamber; apertural process terminal, compressed subconoidal, aperture an elongate collared slit low in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	89	549080	0.34	0.27	0.15

Robulus cultus Israelsky n. sp.

Plate 17, figures 27, 28

In side view subovate, apertural end acutely pointed, opposite end rounded, periphery of last chamber tending to straighten, final margin of last chamber and periphery of earliest visible chamber forming a low obtuse angle, sutural bands flush, gently reflexed, earlier sutures tangent to umbo, later sutures radiate, sutures meeting periphery at about 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined broad thin keel on all chambers; in edge view subelliptical, strongly produced at end away from aperture, greatest thickness through umbos, septal face heart-shaped, depressed, bounded on either side by inwardly beveled rim; apertural process subconoidal, aperture an elliptical collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	19	549081	0.75	0.74	0.24

The closest figured form seems to be that referred to *Robulus pseudocultratus* Cole by Howe (1939, pl. 5, figs. 2, 3, Eocene) in which, however, the periphery lacks the angulation present in *Robulus cultus* Israelsky n. sp.; the umbo appears more eccentric and the septal face is more V-shaped.

Cole's original figure (1927, pl. 1, fig. 5, side view only, Eocene) shows all sutures to be radial and lacks the protruding apertural process present in Howe's specimen and the present species.

Robulus ponderosus Israelsky n. sp.

Plate 17, figures 29–32

In side view subovate, apertural end bluntly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming a low obtuse angle, sutures slightly depressed, tangential to umbo, meeting periphery at about 45 degrees, umbo eccentric, slightly swollen, height of chamber at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, slightly produced at either end, greatest thickness through umbos, septal face subtrigonal, depressed, bounded laterally by low rounded rims; apertural process conspicuous, subconoidal, compressed; aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	41	549082	0.62	0.49	0.33
Paratype	41	549083	.35	.33	.28

The highly inflated smaller specimen (figs. 31, 32) is taken to be the young of the species.

Robulina gravida Sequenza (1880, pl. 13, fig. 23, Miocene) has some resemblance but its outline is scalloped, it has a less accentuated apertural process and a less eccentric umbo, it is proportionally thicker and its final face is more V-shaped than in *Robulus ponderosus* Israelsky n. sp.

Robulus sp. BS

Plate 17, figures 33, 34

In side view subovate, bluntly pointed at apertural end, rounded at opposite end, periphery of each of last two chambers straightened with resulting angulate appearance, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, reflexed, meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, last two chambers noticably higher than the earlier chambers, poorly defined narrow thin rim present; in edge view subelliptical, slightly produced at either end, greatest thickness through umbos, septal face elongate heart-shaped, depressed, bounded laterally by gently rounded rims; apertural process subconoidal, compressed, with radial striae, aperture an elongate slit between two radial ridges on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	6+1′	549084	0.93	0.76	0.45

In side view this species might easily be mistaken for *Cristelleria* sp. G but that form has a convex septal face and a simple aperture.

Robulus pustulatus Israelsky n. sp.

Plate 17, figures 35, 36

In side view subovate, weakly angulate, broadly pointed at apertural end, rounded at opposite end, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, sutures flush, gently reflexed, meeting periphery at about 45 degrees, with low blisterlike swellings covering the sutures centrally, umbilicus subcentral, height of chambers at periphery irregular, poorly defined rims on periphery and final margin of last chamber; in edge view subelliptical, indented through umbilici, greatest thickness through final chamber, septal face elongate heart-shaped, bounded laterally by well-defined rounded rims; apertural process subconoidal, aperture an elongate triangular opening in final face of process, with rims on either side.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	6+1′	549085	0.40	0.35	0.20

Cristellaria protuberans Cushman (1919a, pl. 22, fig. 2, side view only, Oligocene) has some resemblance but is much more uncoiled and proportionally elongate.

Robulus sp. BT

Plate 17, figures 37, 38

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting smoothly without offset, sutures flush, inclined toward terminus, radiate, meeting periphery at various angles from about 90 to nearly 45 degrees, umbo very eccentric, height of chambers at periphery irregular, those of last two markedly greater than those of earlier chambers, margin without rim or keel; in edge view subelliptical, slightly produced toward apertural end, greatest thickness through final chamber, septal face roundly subtrigonal, weakly convex, almost flat, rounding into lateral faces of final chamber; apertural process subconoidal, grooved on sides, aperture an elongate slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	55	549086	0.20	0.14	0.11

Robulina deformis Reuss (1851, pl. 4, fig. 30, Oligocene) has some resemblance but it has more reflexed sutures, a depressed septal face and is proportionately broader and thicker.

Robulus sp. BU

Plate 17, figures 39, 40

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber

and periphery of earliest visible chamber forming angle slightly greater than a right angle, sutures except last flush, nearly straight, radiate, meeting periphery at nearly 90 degrees, final suture gently curved, depressed, meeting periphery at nearly 45 degrees, final chamber swollen, umbo eccentric, height of chambers at periphery irregular, well-defined broad thin keel on all chambers; in edge view crudely subelliptical, bilobate, indented at juncture of last chamber with earliest visible chamber, somewhat produced at apertural end, greatest thickness through last chamber, septal face heart-shaped, bounded laterally by sharp ridges; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	74	549087	0.28	0.23	0.12

Robulus sp. BV

Plate 17, figures 41, 42

In side view subovate, apertural end pointed, opposite end rounded, reflexed, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, gently reflexed, radiate from umbo, meeting periphery irregularly at from about 45 degrees to nearly 90 degrees, umbo eccentric, height of chambers at periphery increasing regularly, well-defined rim on all chambers; in edge view subelliptical, slightly produced at apertural end, greatest thickness through last chamber, septal face very elongate heart-shaped, depressed, transversely flattened, bounded laterally by low rounded rims; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	78	549088	0.33	0.24	0.13

This form bears some resemblance to *Cristellaria inaequalis* Costa of Fornasini (1898, pl. 2, fig. 6, Tertiary) but is proportionately thinner, sutures are less strongly bent and the septal face is proportionately longer. There is perhaps closer resemblance to *Cristellaria dubiensis* Berthelin (1880, pl. 3, fig. 24, Cretaceous) but the same contrasts exist.

Robulus sp. BW

Plate 17, figures 43, 44

In side view subovate, roundly subtrigonal, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber merging without offset, sutural bands flush, earlier ones radiate, later ones tangential to umbo, sutures almost straight except last which is gently reflexed, meeting periphery irregularly at from about 45 to nearly 90 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, rim very poorly defined; in edge view subelliptical, slightly produced at apertural end, greatest thickness through last chamber, septal face heart-shaped, roundly subtrigonal, flattened, rounding into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	87	549089	0.27	0.20	0.12

Robulus sp. BX

Plate 17, figures 45, 46

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, earlier sutures almost straight, last slightly reflexed, tangent to umbo, meeting periphery at nearly 90 degrees, umbo very eccentric, height of chambers at periphery irregular, that of last chamber about double that of previous chamber, poorly defined rim present; in edge view subelliptical, greatest thickness through final chamber, septal face elongate heart-shaped, weakly depressed, bounded laterally by low rounded rims; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	87	549090	0.25	0.19	0.12

There is some resemblance to *Robulina depauperata* Reuss (1863, pl. 6, figs. 67, 68, Oligocene) but that form is proportionally both broader and thicker as well as having fewer chambers.

Robulus sp. BY

Plate 18, figures 1, 2

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a low obtuse angle, sutural bands flush, earlier ones radiate, nearly straight, later ones tangential to umbo, gently reflexed, all meeting periphery at nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, final chamber notably higher than previous one, poorly defined rim on all chambers; in edge view subelliptical, somewhat produced at end away from aperture, greatest thickness through final chamber close to umbo, septal face heart-shaped, slightly depressed, bounded laterally by low rounded rims which merge into lateral faces of final chamber; apertural process subconoidal with few striae on sides, aperture an elon-

gate elliptical opening in the final face of process bounded by a U-shaped collar which opens onto septal face of test.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	100	549091	0.33	0.24	0.20

This form bears some resemblance to Liebus' (1921, p. 53, fig. 3, Tertiary) *Cristellaria crassa* d'Orbigny var., but that species has a more eccentric umbo, its early sutures are distinctly reflexed and it is proportionally very much thinner.

Robulus serenus Israelsky, n. sp.

Plate 18, figures 3, 4

In side view subovate, roundly subtrigonal, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a high obtuse angle, sutures flush, slightly reflexed, early ones inclined forward, meeting periphery at about 45 degrees, last two meeting periphery at nearly 90 degrees, umbo very eccentric, height of chambers at periphery irregular, accelerating in last two chambers, well-defined rim on all chambers; in edge view subelliptical, somewhat produced at apertural end, greatest thickness through last chamber, septal face elongate heart-shaped, flattened transversely, slightly depressed, bounded laterally by weakly rounded rims; apertural process subconoidal with radial striae, aperture an elongate collared slit on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	83	549092	0.48	0.23	0.18

A far-fetched comparison may be made with Brady's (1884, pl. 69, figs. 8, 9, Recent) figure of *Cristellaria gibba* d'Orbigny which has a more central umbo, more strongly curved sutures and is proportionally much thinner.

Cushman's (1926, p. 19, fig. 10, Cretaceous) specimen called *Cristellaria* cf. *lepida* (Reuss) is possibly identical but the presence or absence of a robuline aperture could not satisfactorily be determined.

Robulus ligatus Israelsky n. sp.

Plate 18, figures 5–8

In side view subovate, roundly subtrigonal, acutely pointed at apertural end, rounded at opposite end, slight angularity between last two chambers with node at intersection, weak sinus at juncture of final margin of last chamber and periphery of earliest visible chamber, sutural bands flush, gently reflexed, radiate, inclined forward, meeting the periphery irregularly in angles varying from about 45 to nearly 90 degrees, umbo very eccentric, height of chambers in early portion increasing irregularly, height of later chambers increasing gradually, well-defined keel on all chambers; in edge view subelliptical, weakly produced at end away from aperture, greatest width slightly toward aperture from umbos, septal face convex, rounding into lateral faces of final chamber; apertural process subconoidal, aperture an elongate opening bounded by V-shaped collar which opens onto septal face.

In young the septal face is somewhat flattened and the angulation between the last two chambers is very weak.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	67	549093	0.36	0.26	0.16
Paratype	68	549094	.24	.16	.15

The form figured by Cushman and Todd (1945b, pl. 13, figs. 26, 27, side views only, Eocene) as *Planularia danvillensis* Howe and Wallace has more strongly reflexed sutures, but lacks the angle and node at juncture of the last two chambers, has nonbanded sutures and supposedly has a nonrobuline aperture.

Robulus frustatus Israelsky n. sp.

Plate 18, figures 9, 10

In side view subovate, acutely pointed at apertural end, rounded at opposite end, periphery of final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, earlier ones more strongly reflexed than later, all tangential to umbo, earliest visible suture meeting periphery at about 45 degrees, later sutures steepening to nearly 90 degrees in the last suture, umbo somewhat eccentric, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, produced at either end, greatest thickness through umbos, septal face strongly convex, merging imperceptibly into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	75	549095	0.33	0.28	0.14

Robulina magnifica Costa MS of Fornasini (1897, p. 112, 3 text figures, Tertiary) has much the same outline in side view but its sutures appear radial throughout, the angulation of the periphery is lacking, the septal face appears depressed and it is proportionately much thinner than the form found in Lodo formation.

Franke's (1927, pl. 2, fig. 18, Paleocene) version of *Cristellaria beyrichi* Bornemann also lacks the weakly angulated periphery and all sutures are radiate.

Robulus sp. BZ

Plate 18, figures 11, 12

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber merging without offset, sutures flush, radiate, gently reflexed, meeting periphery irregularly from about 45 degrees to nearly 90 degrees, the last suture sinuous and inclined toward apertural end at periphery, umbo eccentric, height of chambers at periphery irregular, poorly defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face convex, merging imperceptibly into lateral faces of final chamber; apertural process subconoidal, aperture an elongate weakly rimmed slit on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	75	549096	0.40	0.29	0.19

Robulus transilis Israelsky n. sp. may readily be distinguished by its tangential sutures.

Marginulina ovata (Galloway and Hemingway) as figured by Cushman and Renz (1947, pl. 4, fig. 3, side view only, Oligocene) has a robuline aperture. It is proportionally both narrower and thinner than *Robulus* sp. BZ and the umbonal area is even more eccentric.

Robulus sp. CA

Plate 18, figures 13, 14

In side view subovate, roundly subtrigonal, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures except last flush, first visible sutures reflexed, strongly bent toward umbo and radiate, the next weakly sinuous and tangent to umbo, last suture somewhat depressed and tangent to umbo, first two sutures meeting periphery at nearly 45 degrees, last two at about 90 degrees, last chamber somewhat inflated and projecting over onto first visible chamber, umbo eccentric, height of chambers at periphery increasing rapidly, rim well defined on first two chambers only; in edge view subelliptical, somewhat produced at apertural end, greatest thickness through final chamber, septal face convex merging imperceptibly with lateral faces of final chamber; apertural process subconoidal, slightly compressed, some weak radial striae present, aperture an elongate weakly collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	75	549097	0.40	0.28	0.15

Lenticulina cf. *theta* Cole of Cushman and R. E. and K. C. Stewart (1947 (1948), pl. 11, fig. 3, Eocene) is very similar in side view but the final chamber is less inflated, and the edge view outline is distinctly bilobate; early sutures are indistinct but seem to be less strongly bent. A robuline aperture is present in the figured specimen.

Robulus sp. CB

Plate 18, figures 15, 16

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, all except last radiate, last tangential to and strongly bent near umbo, meeting periphery irregularly at from about 60 to nearly 90 degrees, umbo eccentric, height of chambers at periphery increasing regularly, poorly defined rim on all chambers; in edge view subelliptical, septal face elongate subtriangular, slightly concave, bounded laterally by weak rims that round into lateral faces of final chamber; apertural process subconoidal, grooved on lateral faces, aperture an elongate slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	37	549098	0.28	0.22	0.15

The closest figure noted is that referred to *Robulus gibbus* (d'Orbigny) by LeRoy, (1941a, pl. 3, figs. 58, 59, Late Tertiary) which is very similar in edge view but in side view shows a much straighter periphery on the last chamber and a much more strongly bent final margin.

Robulus projectus Israelsky n. sp.

Plate 18, figures 17, 18

In side view subovate, bluntly pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, proportionally broad sutural bands flush except the last which is slightly depressed, all except last nearly straight, last slightly sinuous, all bands inclined forward, radiate, meeting periphery at angles of about 45 to 60 degrees, umbo very eccentric, apertural process quite prominent, with single radial groove discernible, height of chambers at periphery irregular, well-defined rim present on all chambers with node at peripheral end of last suture; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos, septal face convex, rounding into lateral faces of final chamber; aperture a collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	102	549099	0.33	0.23	0.13

Robulus sp. CC

Plate 18, figures 19, 20

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, earliest visible two strongly reflexed, next two hooked near umbo, the fourth straightening between the hook and the periphery, fifth suture nearly straight, tangential to strong bow in previous suture, final suture slightly bent at contact with previous suture truncating the earlier whorl, all except last suture meeting periphery at about 45 degrees, the last at about 60 degrees, umbo eccentric, height of chambers at periphery increasing regularly, broad keel on all chambers; in edge view, outline compressed subelliptical, slightly produced toward either end, thickest through umbonal area, septal face V-shaped, slightly depressed, bounded laterally by weak rims, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	38	549100	0.25	0.23	0.12

Perhaps the closest figured specimen is that referred to *Robulus dicampyla* (Franzenau) by Bermudez (1949, p. 7, figs. 23, 24, Miocene) in which, however, none of the sutures become tangential.

Robulus odiosus Israelsky n. sp.

Plate 18, figures 21–26

In side view subovate, apertural end acutely pointed, opposite end rounded, in adult periphery of last few chambers tending to straighten giving angulate appearance, in young periphery smoothly curved throughout, final margin of last chamber meeting periphery of earliest visible chamber in a very low obtuse angle in the adult, in a larger obtuse angle in the young, sutures flush, reflexed, tangential to umbo, early sutures meeting periphery at about 45 degrees, later at nearly 90 degrees, in adult covered by bands, umbo eccentric, height of chambers, at periphery irregular, rim present on all chambers, becoming more pronounced with growth; in edge view subelliptical. produced at either end, greatest thickness through umbo, septal face heart-shaped, more elongate in the adult than in the young, slightly depressed, bounded laterally by weak rims; apertural process subconoidal, compressed, the aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	105	549101	0.33	0.26	0.17
Paratype	105	549102	.31	.25	.16
Paratype	105	549103	.27	.22	.15

Lenticulina incrassata Marie (1941, pl. 10, fig. 108, Cretaceous) is very similar in outline but has straight sutures and lacks a robuline aperture.

Robulus tardus Israelsky n. sp.

Plate 18, figures 27, 28

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, early sutures slightly raised, later flush, sutural bands varying irregularly from gently reflexed to almost straight, tangential to umbo, earlier sutures meeting periphery irregularly from about 60 to nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, weakly produced at apertural end, more strongly produced at opposite end, greatest thickness through umbos, septal face elongate heart-shaped, slightly depressed, bounded laterally by low rims; apertural process subconoidal, aperture an elliptical collared opening in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	58	549104	0.40	0.34	0.20

Cristellaria degolyeri Plummer (1926, pl. 7, fig. 7, Eocene) has a similar outline but its sutures are more strongly reflexed, the test is proportionally much thinner and a robuline slit is neither illustrated nor mentioned in the text.

Robulus degolyeri (Plummer) of Bandy (1944, pl. 60, fig. 5, Eocene) has more strongly reflexed sutures, is more tightly coiled and the apertural process is proportionally broader and thinner than is the case with *Robulus tardus* Israelsky n. sp.

Robulus sp. CD

Plate 18, figures 29, 30

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, ranging from radiate to tangential, meeting periphery at about 45 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view subelliptical, somewhat produced at either end, greatest thickness through umbos, septal face broadly V-shaped, slightly depressed, bounded laterally by low ridges which round into the lateral faces of final chamber; apertural process subconoidal, aperture an elongate rimmed slit on final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	63	549105	0.65	0.55	0.33

Cristellaria (*Cristellaria*) *semi-impressa* Reuss (1866, pl. 3, fig. 13, Oligocene) is very similar but has all sutures tangential to the umbo and is more compressed than the present form.

Robulus convergens (Bornemann) of Bermudez (1949, pl. 7, figs. 49, 50, Oligocene) has a very similar outline but its sutures are much straighter.

Robulus sp. CE

Plate 18, figures 31, 32

In side view subovate, apertural end broadly pointed, opposite end rounded, periphery of last chamber straightened, resulting in angulate appearance, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, sutural bands flush, gently reflexed, all radial from umbo and meeting periphery at about 45 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, well-developed rim on all except earliest two visible chambers; in edge view subelliptical, greatest thickness through umbo, septal face flatly convex, rounding into lateral faces of last chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	70	549106	0.51	0.46	0.27

This form is readily distinguished from *Robulus* sp. CD by its somewhat angulate periphery and greater inflation.

Robulus spasticus Israelsky n. sp.

Plate 18, figures 33, 34

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber strongly bowed, meeting periphery of earliest visible chamber in an obtuse angle, sutural bands flush, gently reflexed, tangential to umbo, all except last meeting periphery at about 45 degrees, last at nearly 60 degrees, umbo subcentral, chamber heights at periphery subequal, well-defined rim on all chambers; in edge view subelliptical, slightly produced at apertural end, greatest thickness through umbos, septal face heart-shaped, convex, merging into lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	68	549107	0.47	0.37	0.23

The apertural process is imperfect in the figured specimen and is described from one in sample 65.

Robulus sp. CF

Plate 18, figures 35, 36

In side view subovate, apertural end broadly pointed, opposite end rounded, straightened periphery of final chamber giving an angulate appearance, final margin of last chamber and periphery of earliest visible chamber meeting in a high obtuse angle, sutures flush, weakly reflexed, all tangential to umbo and meeting periphery at about 45 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through somewhat swollen umbos, septal face convex, merging imperceptibly into lateral faces of final chamber; apertural process subconoidal, compressed, aperture a narrow slit in final face of the process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	74	549108	0.46	0.40	0.21

The tangential sutures readily separate this form from *Robulus* sp. CI.

Robulus sp. CG

Plate 18, figures 37, 38

In side view subovate, acutely pointed at apertural end, opposite end rounded, final face of last chamber and periphery of earliest visible chamber forming a high obtuse angle, sutural bands broad, last band reflexed, others straight, first three visible sutures flush, radiate, meeting periphery at nearly 90 degress, last two slightly depressed, tangential to umbo and meeting periphery at about 45 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbo, septal face flattened, rounding into lateral faces of final chamber; apertural process subconoidal, aperture an alongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	100	549109	0.33	0.24	0.14

Robulus? sp. CH

Plate 18, figures 39, 40

In side view subovate, broadly pointed at apertural end, rounded at opposite end, periphery of final chamber somewhat straightened resulting in weakly angulate appearance, final margin of last chamber and periphery of earliest visible chamber meeting in a very high obtuse angle, almost in a straight line, sutural bands flush, tangential to umbo, all except last meeting periphery at nearly 45 degrees, the last at about 60 degrees, umbo subcentral, height of chambers at periphery irregular,

well-defined rim on all chambers; in edge view subelliptical, produced toward either end, greatest thickness through umbos, septal face elongate heart-shaped, weakly depressed, bounded laterally by low rounded rims which merge into lateral faces of final chamber; apertural process broken.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	68	549110	0.45	0.33	0.25

Robulus sanus Israelsky n, sp.

Plate 18, figures 41, 42

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutural bands very slightly reflexed, tangential to umbo, all except last meeting periphery at about 45 degrees, last at nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, slightly produced at either end, septal face weakly convex and rounding into lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate rimmed slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	68	549112	0.58	0.48	0.29

Robulus fresnoensis Israelsky n. sp. may be distinguished by its somewhat angulate outline, its more blunt apertural end, its truncating final suture and the greater curve of its sutures.

In the specimens referred by Brady (1884, pl. 69, figs. 6, 7, Recent) to *Cristellaria convergens* Bornemann each has the final face of last chamber and periphery of first visible chamber meeting in almost a straight line and the sutures are more strongly bent.

Robulus sp. CI

Plate 18, figures 43, 44

In side view subovate, periphery of final chamber straightened giving angulate appearance, apertural end broadly pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in very large obtuse angle, almost in a straight line, sutures flush, gently reflexed to nearly straight, radiate from umbo, meeting periphery almost at right angles, umbo subcentral, height of chambers at periphery irregular, peripheral rim poorly defined; in edge view subelliptical, slightly produced at apertural end, septal face convex, merging imperceptibly into lateral faces of final chamber; apertural process subconoidal, slightly compressed, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	67	549111	0.51	0.41	0.22

This form is readily distinguished from *Robulus sanus* Israelsky n. sp. and *Robulus fresnoensis* Israelsky n. sp. by its more radial sutures.

Robulus alato-limbatus (Gümbel) ? of Cushman and Siegfus (1942, pl. 15, fig. 20, not 19, 21, Eocene) has a practically identical suture pattern, but the peripheral angulation is notably stronger and it is proportionally thicker.

Robulus fractus Israelsky n. sp.

Plate 18, figures 45, 46

In side view semicirculoid, apertural end acutely pointed, opposite end rounded, final margin and periphery of earliest visible chamber merging without offset and forming almost a straight line, sutural bands flush, tangential to umbo, meeting periphery irregularly at about 45 degrees to nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face subtrigonal, slightly depressed, bounded laterally by low rounded rims, apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	82	549113	0.20	0.18	0.11

Various specimens of Cretaceous age in the U. S. National Museum referred to *Cristellaria ovalis* Reuss have superficial resemblances to the present form but most of them are proportionally thicker and lack the sutural bands of *Robulus fractus* Israelsky n. sp.

Robulus roscidus Israelsky n. sp.

Plate 18, figures 47, 48

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber merging gently with periphery of earliest visible chamber, sutural bands flush, gently reflexed, earlier bands meeting periphery at nearly 90 degrees and radiate from umbo, later sutures meeting the periphery at nearly 45 degrees and tangential to umbo, umbo slightly eccentric, height of chambers at periphery subequal, well-defined rim on all chambers; in edge view subelliptical, weakly produced toward apertural end, greatest thickness through umbos, septal face very elongate heart-shaped, weakly concave, bounded laterally by low rounded rims which merge into lateral faces of final chamber; apertural process subconoidal, slightly

compressed, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	66	549114	0.40	0.31	0.20

In side view there is a strong resemblance to the form referred to *Cristellaria convergens* Bornemann by Brady (1884, pl. 69, figs. 6, 7, Recent) but the early sutures are more strongly reflexed and the final face is smoothly convex in that form.

Robulus spasticus Israelsky n. sp. may be distinguished by its more strongly bowed final margin, its proportionally lesser width and its smoothly convex septal face.

Robulus volaticus Israelsky n. sp.

Plate 18, figures 49, 50

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber blending smoothly without offset, sutures flush, almost straight, tangential to umbo, all except last suture meeting periphery at from about 45 to nearly 60 degrees, the last at nearly 90 degrees, umbo slightly eccentric, height of chambers at periphery irregular, rim on all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos; septal face quadrately heart-shaped, slightly convex, rounding into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	78	549115	0.25	0.21	0.14

This form may be distinguished from *Robulus sanus* Israelsky n. sp. by the lack of offset between the final margin and the periphery of the earliest visible chamber, its more quadrate septal face, and its less tangent early sutures.

Robulus transilis Israelsky n. sp.

Plate 18, figures 51, 52

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber merging without offset, sutures flush, gently reflexed, earlier sutures radiate, later tangential to umbo, next to last chamber overlapping umbo and in turn overlapped by final chamber, sutures meeting periphery irregularly at various angles between about 45 and 90 degrees, umbo somewhat eccentric, height of chambers at periphery irregular, fairly well defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face convex, merging imperceptibly into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	80	549116	0.40	0.28	0.18

The closest figures noted are those called *Planularia* cf. *danvillensis* Howe and Wallace by Cushman and Todd (1945 b, pl. 13, figs. 26, 27, Eocene) which unfortunately are both side views. Their figures show a proportionally narrower outline.

Robulus fresnoensis Israelsky n. sp.

Plate 18, figures 53, 54

In side view subovate, broadly pointed at apertural end, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in a high obtuse angle, merging smoothly without notable offset, periphery tending to straighten on each of last four chambers giving weakly angulate appearance, sutural bands gently reflexed, tangential to umbo, meeting periphery at about 45 degrees except last which meets at nearly 60 degrees, umbo subcentral, height of chambers at periphery increasing regularly, well-defined rim on all chambers; in edge view subelliptical, slightly produced at either end, greatest thickness through umbos, septal face convex, merging imperceptibly with lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Holotype	63	549117	0.49	0.40	0.25

Robulus alabamensis Cushman (1944, pl. 5, fig. 13, Paleocene) is close but its umbo appears more eccentric, the final margin of the last chamber and the periphery of the earliest visible chamber are offset, the septal face flattened, and it seems to be proportionally thinner.

Robulus sp. CJ

Plate 19, figures 1, 2

In side view subcircular, apertural end acutely pointed, opposite end rounded, final margin and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, tangent to umbo, meeting periphery irregularly at various angles of about 45 degrees to nearly 60 degrees, umbo subcentral, height of chambers at periphery irregular, keel well defined on early portion of periphery, poorly defined on later portion; in edge view subelliptical, somewhat produced at end away from aperture, greatest thickness through umbos, septal face indistinctly bounded, flatly convex, rounding into lateral faces of final chamber; apertural

process subconoidal, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	75	549118	0.34	0.33	0.19

The convex septal face contrasts with the depressed septal face found in *Robulus arcanus* Israelsky n. sp.

Robulus sp. CK

Plate 19, figures 3, 4

In side view subovate, acutely pointed at apertural end, angulately rounded at opposite end, periphery of each chamber except first visible one straightened, giving angulate outline, sutural bands flush, nearly straight, radiate from umbo, meeting periphery at nearly 90 degrees, umbo very eccentric, height of chambers at periphery irregular, well defined rim on all chambers, noded at contact with sutures; in edge view subelliptical, greatest thickness through umbos, septal face elongate heart-shaped, flattened, rounding into lateral faces of final chamber; apertural process subconoidal, transversely compressed, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	86	549119	0.35	0.25	0.16

Robulus sp. CL

Plate 19, figures 5, 6

In side view subovate, acutely pointed at apertural end, rounded at opposite end, periphery of final chamber straightened giving weakly angulate appearance, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutural bands flush, gently reflexed, radiate from umbo, earliest suture meeting periphery at about 45 degrees, later at nearly 90 degrees, umbo very eccentric, height of chambers at periphery increasing regularly, well-defined rim on all chambers; in edge view subelliptical, greatest thickness through penultimate chamber, septal face very elongate heart-shaped, weakly concave, bounded laterally by low rims which round into lateral faces of final chamber; apertural process subconoidal, aperture an elongate weakly collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	67	549120	0.31	0.22	0.16

Robulus sp. CM

Plate 19, figures 7, 8

In side view subovate, acutely pointed at apertural end, opposite end rounded, peripheries of last three chambers tending to straighten giving a weakly angulate outline, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, sutures flush, very slightly reflexed, almost straight, radiate, meeting periphery at nearly 90 degrees, umbo slightly eccentric, height of chambers at periphery increasing regularly, poorly defined rim on all chambers; in edge view subelliptical, very slightly produced at apertural end, greatest thickness through umbos, septal face flatly convex, rounding into lateral faces of final chamber; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	80	549121	0.25	0.19	0.11

Robulus sp. CN

Plate 19, figures 9, 10

In side view subovate, acutely pointed at apertural end, rounded at opposite end, weakly rimmed final margin of last chamber and periphery of earliest visible chamber meeting smoothly with very slight offset, sutural bands flush, radiate, first visible sutures meeting periphery at about 45 degrees, later at nearly 90 degrees, umbo very eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, somewhat produced at end away from aperture, greatest thickness toward apertural end from umbos, septal face elongate heart-shaped, weakly depressed, bounded laterally by weak rims; apertural process subconoidal, compressed, grooved laterally, aperture an elongate collared slit in final face of the process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	83	549122	0.30	0.20	0.15

Robulus sp. CO

Plate 19, figures 11, 12

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, early sutures flush, final two slightly depressed, all sutures radiate from umbo, two earliest visible sutures meeting periphery at nearly 45 degrees, others irregularly from about 60 to nearly 90 degrees, umbo slightly eccentric, height of chambers at periphery irregular, well-defined rim on periphery of all chambers; in edge view subelliptical, slightly produced at apertural end, greatest thickness through umbos, septal face elongate heart-shaped, flattened, bounded laterally by weak ridges; apertural process subconoidal, aperture an elongate slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	83	549123	0.49	0.41	0.23

Cristellaria (*Cristellaria*) *impressa* Reuss (1862, pl. 9, fig. 2, Cretaceous) has some resemblance but is proportionately narrower and thicker and has a proportionately smaller umbo.

Cristellaria (*Robulina*) *inornata* d'Orbigny of Franke (1927, pl. 3, fig. 2, Paleocene) is also close but has more strongly reflexed and tangential sutures.

Robulus sp. CP

Plate 19, figures 13, 14

In side view subovate, acutely pointed at apertural end, rounded at opposite end, periphery of last chamber becoming almost straight, resulting in weakly angulate outline, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, gently reflexed, tangential to umbo, meeting periphery irregularly at from about 45 degrees to nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, slightly produced at end away from aperture, greatest thickness through umbos, septal face elongate heart-shaped, flattened, very slightly depressed, bounded laterally by weak rims; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	83	549124	0.39	0.31	0.21

Robulus sp. CP is less angulate than *Robulus odiosus* Israelsky n. sp. at the same stage of growth as well as being proportionally thicker.

Robulus sp. CQ

Plate 19, figures 15, 16

In side view subovate, acutely pointed at apertural end, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber merging smoothly without offset, sutures flush except last (which is gently depressed, resulting in slight inflation of final chamber), sutures tangential to umbo, earlier sutures meeting periphery at about 90 degrees, last at nearly 45 degrees, umbo eccentric, height of chambers at periphery irregular, poorly developed rim on all chambers; in edge view subelliptical, apertural end weakly produced, greatest thickness through umbos, septal face convex, blending imperceptibly into lateral faces of final chamber; apertural process subconoidal, compressed, few striae radiating from apex, aperture an elongate slit in final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	22	549125	0.51	0.35	0.23

Cushman's (1933, pl. 2, figs. 2, 6, 7, Recent) figures referred to *Robulus gibbus* (d'Orbigny) have some resemblance, but in that species the umbo is even more eccentric and the sutures more strongly reflexed.

Robulus sp. CR

Plate 19, figures 17, 18

In side view subovate, roundly subtrigonal, apertural end acutely pointed, opposite end rounded, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, first three sutural bands flush, reflexed, radiate, meeting periphery at about 45 degrees, final suture truncating previous suture and tangential to umbo, meeting periphery at nearly 90 degrees, umbo subcentral, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view subelliptical, compressed through umbonal area, greatest thickness through umbos, septal face elongate heart-shaped, concave, apertural process subconoidal, aperture an elongate collared slit in the final face of process.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	64	549126	0.29	0.23	0.13

Robulus sp. CS

Plate 19, figures 19, 20

In side view subovate, crudely subquadrangular, periphery bending without respect to sutural intersections, apertural end obtusely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber forming an obtuse angle, final margin weakly rimmed, the rim extending onto first visible chamber, first visible suture weakly reflexed, inclined forward, meeting periphery at about a 60 degree angle, truncated by second sutural band, other sutures gently reflexed, inclined rearwards, tangential to umbo and meeting periphery at about 45 degrees, umbo eccentric, swollen, height of chambers at periphery increasing regularly, well-defined keel on whole of periphery; in edge view broadly subelliptical, produced at either end, greatest thickness through umbos, septal face broadly V-shaped, transversely concave, bounded laterally by inwardly beveled rims; apertural process subconoidal, aperture an elongate subtriangular opening in final face of process bounded by a U-shaped collar which opens onto the septal face.

Specimen	Sample	USNM	Dimensions in millimeters		
			Length	Width	Thickness
Figured	102	549127	0.65	0.56	0.48

Robulus sp. CT

Plate 19, figures 21, 22

In side view subovate, apertural end acutely pointed, opposite end rounded, low rimmed final margin of last chamber (which extends onto earlier chambers) and periphery of earliest visible chamber forming an obtuse angle, earlier sutures probably radiate (not clearly seen), two final sutures reflexed, tangential to umbo, meeting periphery at about 45 degrees, umbo very eccentric, well-defined rim on all chambers; in edge view subovate, acutely pointed at apertural end with projecting apertural process, opposite end broadly rounded with projecting rim, greatest thickness through umbos: septal face broadly **V**-shaped, depressed, bounded laterally by low rounded rims; apertural process subconoidal, aperture an elongate collared slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	100	549128	0.48	0.39	0.34

The figure overaccents distinction between rim and body of test.

This form bears a superficial resemblance to the species called *Cristellaria crassa* d'Orbigny by Brady (1884, pl. 70, fig. 1, Recent) but is proportionally thicker, has a proportionally thicker rim, a straighter final margin and a more conspicuous apertural process.

Robulus sp. CU

Plate 19, figures 23, 24

In side view subtrapezoidal, angulate, angling either at or between points of contact with sutural bands, final margin of last chamber and periphery of earliest visible chamber meeting without offset, sutures broadly banded, weakly reflexed, tangential to umbo, last suture meeting periphery at about 60 degrees, previous suture at nearly 45 degrees, umbo eccentric, well-defined rim on periphery of all chambers; in edge view broadly subovate, weakly produced at apertural end, greatest thickness through umbos, septal face heart-shaped, weakly depressed, bounded laterally by low rounded rims; apertural process subconoidal, aperture an elliptical collared opening in the final face of the process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	82	549129	0.21	0.18	0.14

The strongly angulate outline precludes this form from being considered the young of *Robulus* sp. CR.

Robulus vatius Israelsky n. sp.

Plate 19, figures 25, 26

In side view subovate, broadly pointed at apertural end, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, broad sutural bands flush, gently reflexed, radiate from umbo, meeting periphery irregularly at angles ranging from about 45 to nearly 90 degrees, umbo subcentral, height of chambers at periphery increasing gradually, poorly-defined rim on all chambers; in edge view subelliptical, greatest thickness through umbos, septal face convex, rounding into lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	19	549130	0.53	0.40	0.21

A side view figure referred to *Robulus wilcoxensis* Cushman and Ponton by Shifflett (1948, pl. 1, fig. 17, side view only; not fig. 18; Eocene) is of similar appearance but its apertural process is more conspicuous and conoidal, the final chamber appears inflated and the final margin is much straighter.

Robulus plicatus Israelsky n. sp.

Plate 19, figures 27, 28

In side view subovate, roundly subquadrate, broadly pointed at apertural end, rounded at opposite end, periphery occasionally tending to straighten giving outline a subquadrate appearance, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, gently reflexed, tangential to umbo, meeting periphery irregularly at about 45 to 90 degrees, umbo subcentral, height of chambers at periphery irregular, narrow rim on all chambers; greatest thickness through umbos, septal face convex, rounding into lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate slit bounded by inwardly opening **U**-shaped collar.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	12	549131	0.50	0.41	0.16

Cristellaria (*Planularia*) *westermanni* Pijpers (1933, p. 61, text figs. 39, 40, Eocene) has much the same chamber plan but is strongly umbilicate and in edge view is strongly bilobed.

Less close is *Robulus wilcoxensis* Cushman and Ponton var. *dissentia* Cushman and Todd (1946, pl. 7, fig. 12, side view only, Paleocene) which has an open umbilicus and inflated chambers. The same figure is repeated by Cushman (1951, p. 4, fig. 18, Paleocene).

Robulus loismartinae Israelsky n. sp.

Plate 19, figures 29, 30

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber and

periphery of earliest visible chamber forming an obtuse angle, sutural bands broad, gently reflexed, all except last narrowing toward periphery, radiate from umbo, meeting periphery at about 45 degrees, final suture S-shaped, truncating earlier whorl and not touching umbo, early sutures flush, last three depressed, with resulting inflation of final three chambers, umbo subcentral, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view irregularly subelliptical, the last and penultimate chambers distinctly swollen, greatest thickness through the penultimate chamber, septal face convex, rounding into lateral faces of final chamber; apertural process subconoidal, compressed, with radial groove on lateral face, aperture an elongate collared slit on final face of process bounded by inwardly opening U-shaped collar.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Holotype	19	549132	0.57	0.48	0.20

Robulus planulus Galloway and Hemingway (1941, pl. 11, fig. 14, Oligocene) is umbilicate, has a concave septal face and does not show the tendency toward becoming uniserial.

Specimens referred to *Cristellaria budensis* Hantken by Nuttall (1932, pl. 1, fig. 5, Oligocene) are superficially similar but the final whorl fails to overlap earlier whorls completely and the septal face is depressed.

Robulus interritus Israelsky n. sp.

Plate 19, figures 31–34

In side view subovate, apertural end acutely pointed, opposite end rounded, final margin of last chamber meeting periphery of earliest visible chamber in an obtuse angle, sutural bands varying from gently reflexed to nearly straight, tangential to umbo, meeting periphery irregularly at various angles from about 45 to nearly 60 degrees, earlier sutures flush, last two somewhat depressed with corresponding weak inflation of final two chambers, umbo subcentral, height of chambers at periphery irregular, well-defined keel on all chambers; in edge view crudely subelliptical, weakly bilobate, apertural end produced, thickness through umbos and final chamber subequal, septal face heart-shaped, slightly depressed, bounded laterally by inwardly beveled ridges; apertural process subconoidal, compressed, aperture an elliptical collared opening in the final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Paratype	64	549133	0.46	0.39	0.19
Holotype	67	549134	.43	.37	.18

This form is readily distinguished from *Robulus loismartinae* Israelsky n. sp. by its less inflated chambers and more tangential sutures.

Robulus? sp. CV

Plate 19, figures 35, 36

In side view subovate, apertural end probably acutely pointed, opposite end rounded, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, early sutures flush, last three depressed with corresponding inflation of last three chambers, sutures radiate, nearly straight, slightly inclined forward, umbo subcentral, raised, height of chambers at periphery irregular; in edge view subelliptical, weakly bilobate, slightly produced at end away from aperture, greatest thickness through umbos, septal face strongly convex, aperture probably an oval collared opening on final face of conoidal apertural process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	67	549135		0.70	0.47

The rather straight radiating sutures serve to distinguish this form from other bilobate species from the Lodo formation.

Genus HEMIROBULINA Stache 1864

In his manual, Galloway (1933, p. 251) designated *Hemirobulina arcuatula* Stache as the genotype of this genus. In his last edition Cushman (1948) still did not regard Stache's genus as valid. Galloway conceived the genus as including forms which have robuline apertures but otherwise are similar to *Vaginulinopsis* (his *Hemicristellaria*), *Astacolus*, and *Saracenaria*. The genotype is *Vaginulinopsis*-like.

Hemirobulina sp. CW

Plate 19, figures 37, 38

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin of last chamber and periphery of earliest visible chamber meeting in an obtuse angle, sutures flush, gently reflexed, sutures in coiled portion tangent to umbo, final suture not touching umbo or previous suture, all sutures meeting periphery at nearly 90 degrees, umbo eccentric, height of chambers at periphery irregular, well-defined rim on all chambers; in edge view crudely subelliptical, strongly produced at apertural end, septal face convex, merging imperceptibly with lateral faces of final chambers, apertural process subconoidal, very strongly compressed with depressions at contact with chamber proper, aperture an elongate slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	103	549136	0.38	0.27	0.14

Hemirobulina sp. CX

Plate 19, figures 39, 40

In side view subovate, acutely pointed at apertural end, rounded at opposite end, final margin meeting rim of earliest visible chamber in a high obtuse angle, sutures flush, gently reflexed, those of coiled portion inclined forward, except the last which meets periphery at about 90 degrees, sutures of coiled portion radial, final suture of uniserial portion of test strongly reflexed, the last suture meeting periphery at about 60 degrees, the previous at about 45 degrees, umbos very eccentric, height of chambers at periphery irregular in coiled portion, well-defined rim on all chambers; in edge view subelliptical, slightly produced at either end, greatest thickness within uncoiled portion of test, septal face convex, merging imperceptibly with lateral faces of final chamber; apertural process subconoidal, compressed, aperture an elongate rimmed slit in final face of process.

Specimen	Sample	USNM	*Dimensions in millimeters*		
			Length	Width	Thickness
Figured	60	549137	0.41	0.28	0.18

Hantken's (1881, pl. 13, fig. 20; pl. 14, fig. 12, Eocene) version of *Cristellaria galeata* Reuss appears to be a similar form but is proportionately broader and its apertural process is much less prominent.

SELECTED BIBLIOGRAPHY

Bandy, O. L., 1944, Eocene Foraminifera from Cape Blanco, Oregon: Jour. Paleontology, v. 18, no. 4, p. 366–377, pls. 60–62.

——— 1949, Eocene and Oligocene Foraminifera from Little Stave Creek, Clarke County, Alabama: Bull. Am. Paleontology, v. 33, no. 131, p. 1–210, pls. 1–27.

——— 1951, Upper Cretaceous Foraminifera from the Carlsbad area, San Diego County, California: Jour. Paleontology, v. 25, no. 4, p. 488–513, pls. 72–75.

Beck, R. S., 1943, Eocene Foraminifera from Cowlitz River, Lewis County, Washington: Jour. Paleontology, v. 17, no. 6, p. 584–614, pls. 98–109.

Bermudez, P. J., 1949, Tertiary smaller Foraminifera of the Dominican Republic: Cushman Lab. Foram. Research, Spec. Pub. 25, 322 p., 36 pls.

Berquist, H. R., 1942, Jackson Foraminifera and Ostracoda, in Scott County: Miss. Geol. Survey Bull. 49, p. 1–146, pls. 1–11.

Berthelin, G., 1880, Mémoire sur les Foraminifères fossiles de l'étage Albien de Monteley (Doubs): Mém. Soc. Géol. France, ser. 3, v. 1, p. 1–84, pls. 24–27.

Bornemann, J. G., 1860, Bemerkungen uber einige Foraminifera aus den Tertiarbildungen der Umgegend von Magdeburg: Zeitschr. Deutsch. geol. Ges., Band 12, p. 156–160, pl. 6.

Brady, H. B., 1884, Report on the Foraminifera dredged by H. M. S. Challenger, during the years 1873–1876: Challenger Rept., Zoology, v. 9, 342 p., 115 pls.

Brotzen, Fritz, 1936, Foraminiferen aus dem swedischen, untersten Senon von Eriksdal in Schonen: Sveriges Geol. Unders., ser. C, no. 396, Arsbok 30, no. 3, p. 1–206, pls. 1–14, 69 figs.

———1948, The Swedish Paleocene and its foraminiferal fauna: Sveriges Geol. Unders., ser. C., no. 493, Arsbok 42, no. 2, p. 1–140, pls. 1–19, 41 figs.

Chapman, F., 1896, The Foraminifera of the Gault of Folkestone, pt. 8, Jour. Roy. Micros. Soc., p. 1–14, pls. 1, 2.

Church, C. C., 1931, Foraminifera of the Kreyenhagen shale: Mining in California, v. 27, no. 2, p. 202–213, 3 pls.

Cole, W. S., 1927, A foraminiferal fauna from the Guayabal formation in Mexico: Bull. Am. Paleontology, v. 14, no. 51, 46 p., 5 pls.

Cushman, J. A., 1919, The smaller fossil Foraminifera of the Panama Canal Zone: U. S. Natl. Museum Bull. 103, p. 45–87, 15 pls.

——— 1921, Foraminifera of the Philippine and adjacent seas: U. S. Natl. Museum Bull. 100, v. 4, p. 1–608, pls. 1–100, 52 figs.

——— 1922. The Foraminifera of the Mint Spring calcareous marl member of the Marianna limestone: U. S. Geol. Survey Prof. Paper 129–F, p. 123–152, 7 pls.

——— 1923. The Foraminifera of the Atlantic Ocean: U. S. Natl. Museum Bull. 104, pt. 4, Lagenidae, p. 1–228, 42 pls.

——— 1926. The Foraminifera of the Velasco shale of the Tampico embayment: Am Assoc. Petroleum Geologists Bull., v. 10, no. 6, p. 581–612, pls. 1–7.

——— 1931a, A preliminary report on the Foraminifera of Tennessee: Tennessee Div. Geology Bull. 41, 116 p., 13 pls

——— 1931b, Cretaceous Foraminifera from Antiqua, B. W. I. Cushman Lab. Foram. Research Contr., v. 7, pt. 2, p. 33–46, pls. 5, 6.

——— 1933a, New Foraminifera from the Upper Jackson Eocene of the Southeastern Coastal Plain Region of the United States: Cushman Lab. Foram. Research, v. 9, pt. 1, p. 1–21, pls. 1, 2.

——— 1933b, The Foraminifera of the Tropical Pacific Collections of the "Albatross," 1899–1900; Part 2.—Lagenidae to Alveolinellidae: U. S. Natl. Museum Bull. 161, pt. 2, p. 1–79, pls. 1–19.

——— 1935, Upper Eocene Foraminifera of the southeastern United States: U. S. Geol. Survey Prof. Paper 181.

——— 1940, Midway Foraminifera from Alabama: Cushman Lab. Foram Research Contr., v. 16, pt. 3, p. 51–73, pls. 9–12.

——— 1941, American Upper Cretaceous Foraminifera belonging to *Robulus* and related genera: Cushman Lab. Foram. Research Contr., v. 17, pt. 3, p. 55–69, pls. 15, 16.

——— 1946a, The Upper Cretaceous Foraminifera of the Gulf coastal region of the United States and adjacent areas: U. S. Geol. Survey Prof. Paper 206.

——— 1946b, The Genus *Sigmoilina* and its species: Cushman Lab. Foram. Research Contr., v. 22, p. 29–45, pls. 5, 6.

——— 1946c, A rich foraminiferal fauna from the Cocoa sand of Alabama: Cushman Lab. Foram. Research, Spec. Pub. 16.

——— 1951, Paleocene Foraminifera of the Gulf Coastal Region of the United States and adjacent areas: U. S. Geol. Survey Prof. Paper 232.

Cushman, J. A., and Applin, E. R., 1926, Texas Jackson Foraminifera: Am. Assoc. Petroleum Geologists Bull., v. 10, no. 2, p. 154–189, 6 pls.

Cushman, J. A., and Cahill, E. D., 1933, Miocene Foraminifera of the Coastal Plain of the Eastern United States; U. S. Geol. Survey Prof. Paper 175–A, p. 1–25, pls. 1–13.

Cushman, J. A., and Church, C. C., 1929, Some Upper Cretaceous Foraminifera from near Coalinga, California: Calif. Acad. Sc. Proc., 4th ser., v. 18, p. 497–530, 6 pls.

Cushman, J. A., and McMasters, J. H., 1936, Middle Eocene Foraminifera from the Llajas formation, Ventura County, California: Jour. Paleontology, v. 10, no. 6, p. 497–517, 4 pls.

Cushman, J. A., and Renz, H. H., 1941, New Oligocene-Miocene Foraminfera from Venezuela: Cushman Lab. Foram. Research Contr., v. 17, pt. 1, p. 1–27, pls. 1–4.

——— 1942, Eocene, Midway, Foraminifera from Soldado Rock, Trinidad: Cushman Lab. Foram. Research, Contr., v. 18, pt. 1, p. 1–14, pls. 1–3.

——— 1946, The foraminiferal fauna of the Lizard Springs formation of Trinidad, British West Indies: Cushman Lab. Foram. Research, Spec. Pub. no. 18.

——— 1947, The foraminiferal fauna of the Oligocene, Ste. Croix formation of Trinidad, B. W. I., Cushman Lab. Foram. Research, Spec. Pub. 22.

Cushman, J. A., and Siegfus, S. S., 1942, Foraminifera from the Kreyenhagen shale of California: San Diego Soc. Nat. History Trans., v. 9, no. 34, p. 385–426, 7 pls.

Cushman, J. A., and Simonson, R. R., 1944, Foraminifera from the Tumey formation, Fresno County, California: Jour. Paleontology, v. 18, no. 2, p. 186–203, 5 pls., 5 figs.

Cushman, J. A., and Stainforth, R. M., 1945, The Foraminifera of the Cipero Marl formation of Trinidad, British West Indies: Cushman Lab. Foram. Research, Spec. Pub. 14.

Cushman, J. A., Stewart, R. E. and Stewart, K. C., 1947 (1948), Lower Coaledo (Upper Eocene) Foraminifera from Sunset Bay, Coos County, Oregon: Ore. Dept. Geol. and Mineral Industries, pt. 4, p. 73–90, pls. 9–11.

Cushman, J. A., and Todd, R., 1945a, A foraminiferal fauna from the Lisbon formation of Alabama: Cushman Lab. Foram. Research Contr., v. 21, pt. 1, p. 11–21, pls. 3, 4.

——— 1945b, Foraminifera of the type locality of the Moodys Marl member of the Jackson formation of Mississippi: Cushman Lab. Foram. Research Contr., v. 21, pt. 4, p. 79–105, pls. 13–16.

——— 1946, A foraminiferal fauna from the Paleocene of Arkansas; Cushman Lab. Foram. Research Contr., v. 22, pt. 2, p. 45–65, pls. 7–11.

ten Dam, A., 1944, Die Stratigraphische Gliederung des Niederländischen Paläozäns und Eozäns nach Foraminiferen: Mededeel. Geol. Stichting, ser C–V, no. 3, p. 1–142, pls. 1–6.

Dorreen, J. M., 1948, A foraminiferal fauna from the Kaiatan stage (upper Eocene) of New Zealand: Jour. Paleontology, v. 22, no. 3, p. 281–300, pls. 36–41.

Egger, J. G., 1899 (1900), Foraminiferen und Ostracoden aus den Kreidemergeln der Oberbayischen Alpen: Abh. Bayer. Akad. Wiss., München, Class 2, Band 21, (1899), 230 p., 27 pls.

——— 1907, Mikrofauna der Kreideschichten des Westlichen bayerischen Waldes und des Gebietes um Regensburg: Ber. Nat. Ver. Passau, p. 1–75, pls. 1–9.

Fornasini, C., 1895, Cristellaria clericii n. sp. Riv. Ital. Pal., Bologna, v. 1, p. 12, text fig.

——— 1897, Note micropaleontologiche: R. Acad. Sci. Ist. Bologna, Rend., v. 1 (1896–97), p. 3-20, text fig. 1, pl. 1.

——— 1898, Intorno ad alcuni foraminiferi illustrati da O. G. Costa: R. Acad. Sci. Ist. Bologna, Rend., v. 2, (1897–98), p. 15–19, pl. 2.

Franke, A., 1911, Foraminiferen des Unter-Eocäntones der Zeigelei Schwarzenbeck: Jahrb. Kön. Preuss. Geol. Landes, v. 32, pt. 2, p. 106–111, pl. 3.

Franke, A., 1925, Die Foraminiferen der Pommerschen Kreide: Greifswald Univ., Geol.-Paleont, Inst., Greifswald, Deutschland, Abh. no. 6, p. 1–96, pls. 1–8.

——— 1927, Die Foraminiferen und Ostracoden des Palaeocäns von Rugaard in Jutland und Sundrogen bei Kopenhagen; Danmarks Geologiske Undersgelse, II Række, nr. 46, p. 1–49, pls. 1–4.

Galloway, J. J., 1933, A Manual of Foraminifera: Bloomington, Indiana.

Galloway, J. J., and Morrey, M., 1929, A lower Tertiary fauna from Manta, Ecuador: Bull. Amer. Paleontology, v. 15, no. 55, p. 1–210, 27 pls.

Garrett, J. B., 1939, Some middle Tertiary smaller Foraminifera from subsurface beds of Jefferson County, Texas: Jour. Paleontology, v. 13, no. 6, p. 575–579, 2 pls.

Gümbel, C. W., 1868 (1870), Beiträge zur Foraminiferenfauna der nordalpen Eocängebilde: Abhandl. kön. bay. Akad. Wiss., München, Band 10, p. 581–730, pls. 1–4.

Hanna, G. D., 1923, Some Eocene Foraminifera near Vacaville, California: Calif. Univ. Dept. Geol. Sci., Bull., v. 14, no. 9, p. 319–328, 2 pls.

Hantken, M., 1881, Die Fauna der Clavulina Szaboi Schichten. I. Foraminiferen: Mitth. Ung. Geol. Anstalt, Band 4, 1875, p. 1–93, pls. 1–16.

Harris, R. W., and Jobe, B. I., 1951, Microfauna of basal Midway outcrops near Hope, Arkansas: The Transcript Press, Norman, Okla., p. 1–113, pls. 1–14.

Howe, H. V., 1939, Cook Mountain Eocene Foraminifera: Louisiana Geol. Survey, Geol. Bull. 14, xi, 122 p., 15 pls.

Jones, T. R., 1852, The Thanet Sands: Quart. Jour. Geol. Soc., London v. 8, p. 235–268, pls. 15, 16.

Keijzer, F. G., 1945, Outline of the Geology of the Province of Oriente, Cuba (E. of 76° W. L.) with notes on the geology of other parts of the island: Utrecht Univ., Geog. geol. Mededeel., Physiogr.-geol. Reeks, ser. 2, no. 6, 239 p., 12 pls.

Kline, V. H., 1943, Clay County Fossils, Midway Foraminifera and Ostracoda: Miss. Geol. Survey Bull. 53, p. 1–98, pls. 1–8.

LeRoy, L. W., 1941, Small Foraminifera from the late Tertiary of the Nederlands East Indies: Colo. School of Mines Quarterly, v. 36, no. 1—

a. Part 1. Small Foraminifera from the Late Tertiary of the Sangkoelirang Bay Area, East Borneo, Nederlands East Indies: p. 13–62, pls. 1–3.

b. Part 2. Small Foraminifera from the late Tertiary of Siberoet Island, off the West Coast of Sumatra, Nederlands East Indies: p. 63–105, pls. 1–7.

c. Part 3. Some small Foraminifera from the type locality of the Bantamien Substage, Bodjong Beds, Bantam Residency, West Java, Nederlands East Indies: p. 107–127, pls. 1–3.

——— 1944, Miocene Foraminifera from Sumatra and Java, Netherlands East Indies: Colorado School of Mines Quarterly, v. 39, no. 3—

a. Part 1. Miocene Foraminifera of Ceneral Sumatra, Netherlands East Indies: p. 7–69, pls. 1–8.

b. Part 2. Small Foraminifera from the Miocene of West Java, Netherlands East Indies: p. 71–113, pls. 1–7.

Liebus, A., 1921, Ergebnisse der mikroskopischen Untersuchung einiger Bohrproben der subbeskielschen Zone: Nat. Zeitsche, Lotos, Band 69, p. 37–56, 1 pl.

Loetterle, G. J., 1937, The micropaleontology of the Niobrara formation in Kansas, Nebraska, and South Dakota: Nebr. Geol. Survey Bull., 2d ser., no. 12, 98 p., 13 pls.

Marie, P., 1941, Foraminifères de la Craie: Les foraminifères de la Craie à *Belemnitella mucronata* du Bassin de Paris: Mus. National Hist. Nat., Mém., Paris, n. s., v. 12, fasc. 1, p. 1–296, 37 pls.

Martin, L. T., 1943, Eocene Foraminifera from the type Lodo formation, Fresno County, California: Stanford Univ. Pub. Geol. Sci., v. 3, no. 3, p. 91–125, pls. 5–9, 3 figs.

Nakkady, S. E., 1950, A new foraminiferal fauna from the Esna shales and Upper Cretaceous of Egypt: Jour. Paleontology, v. 24, no. 6, p. 675–692, 2 pls.

Nuttall, W. L. F., 1932, Lower Oligocene Foraminifera from Mexico: Jour. Paleontology, v. 6, no. 1, p. 3–35, 9 pls.

Orbigny, A. D. d', 1846, Foraminifères fossiles du Bassin tertiarie de Vienne: Paris, 312 p., 21 pls.

Parr, W. J., 1950, B. A. N. Z. Antarctic Research Exped., 1929–1931 Reports, ser. B, v. 5, pt. 6, Foraminifera, p. 233–392, pls. 3–15, text figs. 1–8.

Perner, J., 1891 (1892), Foraminifery Ceskeho Cenomanu: Ceska Akad. Cis. Frantiska Josefa, Třida 16, p. 49–65, pls. 1–10.

——— 1892, Foraminifery Českého Cenomanu; Česká Akad. Císaře Františka Josefa, Pal. Bohemiae, Praha, Czechoslovakia, Třida 2, nr. 1, p. 49–65, pls. 1–10.

Pijpers, P. J., 1933, Geology and paleontology of Bonaire (Danish West Indies): Geog. en geol. Mededeel., Utrecht, Rijksunwersiteit, Geog. en mineral.-geol. Inst., Physiog.-geol. Reeks 8, 103 p., 147 figs., 2 pls. map.

Rau, W. W., 1948, Foraminifera from the Porter shale (Lincoln formation), Grays Harbor County, Washington: Jour. Paleontology, v. 22, p. 152–174, pls. 27–31.

Reuss, A. E., 1851a, Beitrage zur Paläontologie der Tertiärschicten Oberschlesiens: Deutsch. Geol. Ges., Zeitschr., Berlin, Deutschland, Band. 3, p. 149–184, pls. 8, 9.

——— 1851b, Ueber die fossilen Foraminiferen und Entomostraceen der Septarienthone der Umgegend von Berlin: Zeitschr. Deutsch. geol. Gesellsch., Band. 3, p. 39–92, pls. 3–7.

——— 1860, Die Foraminiferen der westphalischen Kreideformation: Sitz. Akad. Wiss. Wien, Math.-Naturw. Cl., Band. 40, p. 147–238, pls. 1–13.

Reuss, A. E., 1861, Die Foraminiferen der Schreibekreide von Rugen: Sitzungsber, k. Ak. iWss. Wien. Band. 44, p. 324–342, 8 pls.

——— 1862 (1863), Die Foraminiferen des norddeutschen Hils und Gault: Sitzungsber, k. Ak. Wiss. Wien, Band. 46, Abth. 1, p. 5–100, pls. 1–13.

——— 1863, Beitrage zur Kenntniss der tertiaren Foraminiferenfauna. 3. Die Foraminiferen des Septarienthones von Offenbach (p. 36–61). 4. Die Foraminiferen des Septarienthones von Kreuznach (p. 61–69): Sitzungsber. k. Ak. Wiss. Wien., Band 48, Abth. 1, (1864), pls. 1–8.

——— 1866, Die Foraminiferen, Anthozoen und Bryozoen des deutschen Septarienthones: K. Akad. Wiss. Wien, Math.-Naturw. Class, Denkschr., Band. 25, p. 117–204, pls. 1–11.

——— 1870, Die Foraminiferen des Septarien-Thones von Pietzpuhl: Sitzungber. k. Akad. Wiss. Wien, Band. 62, Abth. 1, p. 455–493.

Schlicht, E. von, 1870, Die Foraminiferen des Septarienthones von Pietzpuhl: Berlin.

Sequenza, G., 1880, Le formazioni terziarie nella provincia di Reggio (Calabria): Atti Accad. Lincei, ser. 3, v. 6, p. 1–446, pls. 1–17.

Shifflet, E., 1948, Eocene Stratigraphy and Foraminifera of the Aquia formation: State of Maryland, Board Nat. Res., Dept. Geology, Mines and Water Resources, Bull. 3, p. 1–93, pls. 1–5.

Stainforth, R. M., 1948, Applied micropaleontology in Coastal Ecuador: Jour. Paleontology, v. 22, no. 2, p. 113–151, pls. 24–26.

Thalmann, H. E., 1949, Bemerkung zur Gattung *Lenticulina* Lamarck 1804: Eclogae Geol. Helvetiae, Band 42, no. 2, p. 508–509.

Toulmin, L. D., 1941, Eocene smaller foraminifera from the Salt Mountain limestone of Alabama: Jour. Paleontology, v. 15, no. 6, p. 567–611, pls. 78–82, 23 figs.

Tutkowski, P., 1888, Foraminifera of the Tertiary and Cretaceous deposits of Kiev II Foraminifera of the bluish clay from Podol borings, Soc. Nat. Kieff, Mem., v. 9, nos. 1–2, p. 1–62, pls. 1–9.

Weinzierl, L. L. L., and Applin, E. R., 1929, The Claiborne formation on the coastal domes: Jour. Paleontology, v. 3, no. 4, p. 384–410, 3 pls.

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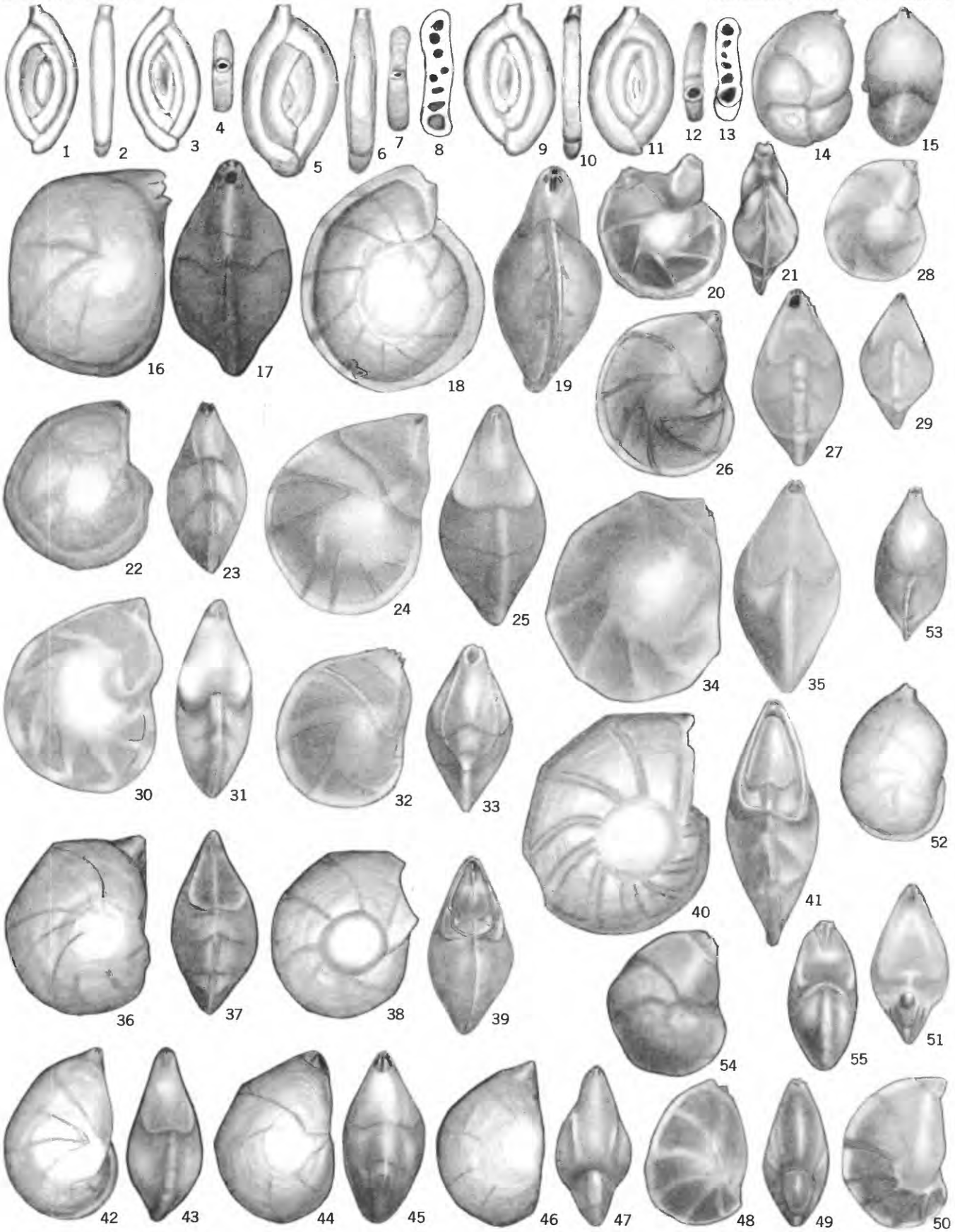
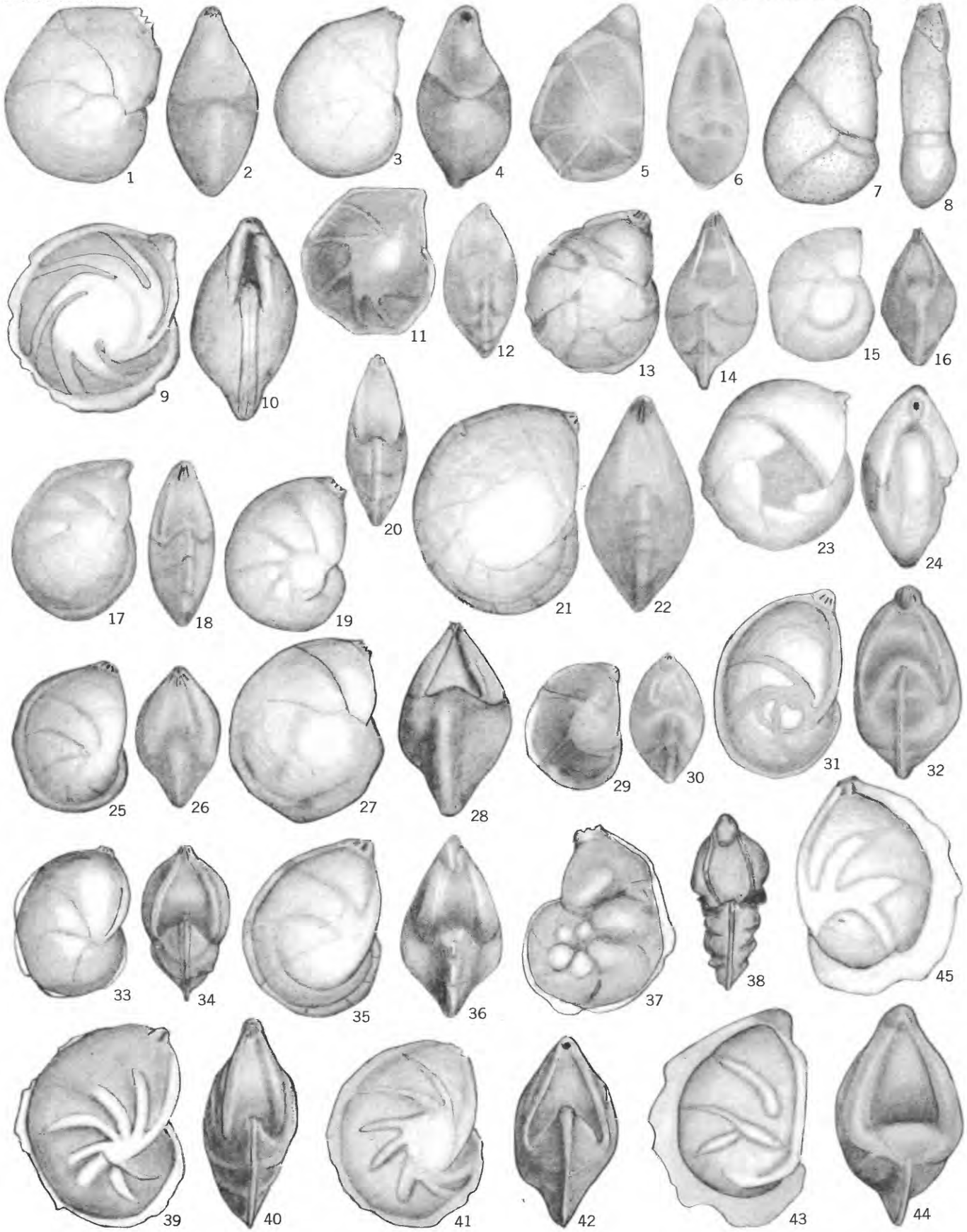


SIGMOILINA AND *CRISTELLARIA*



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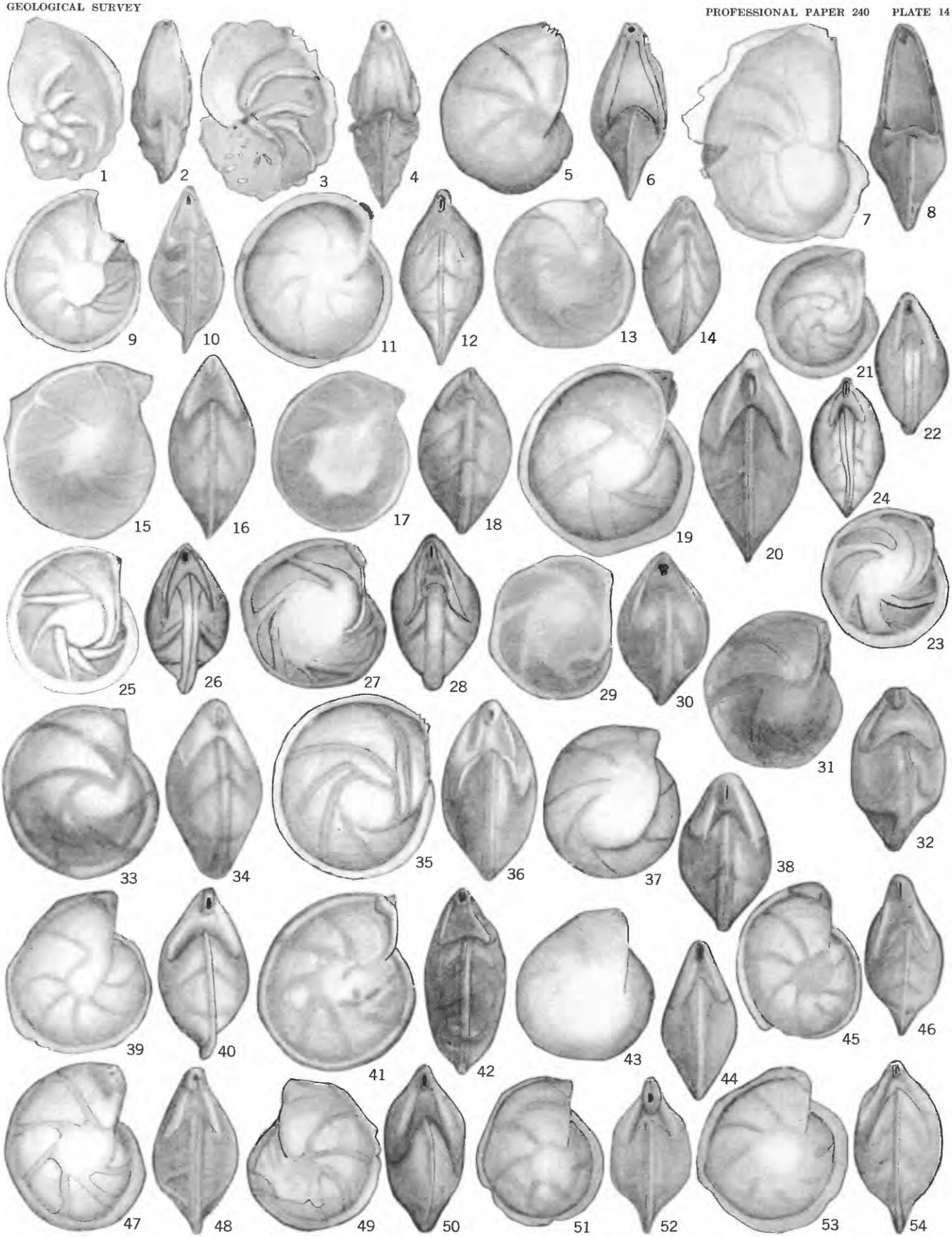
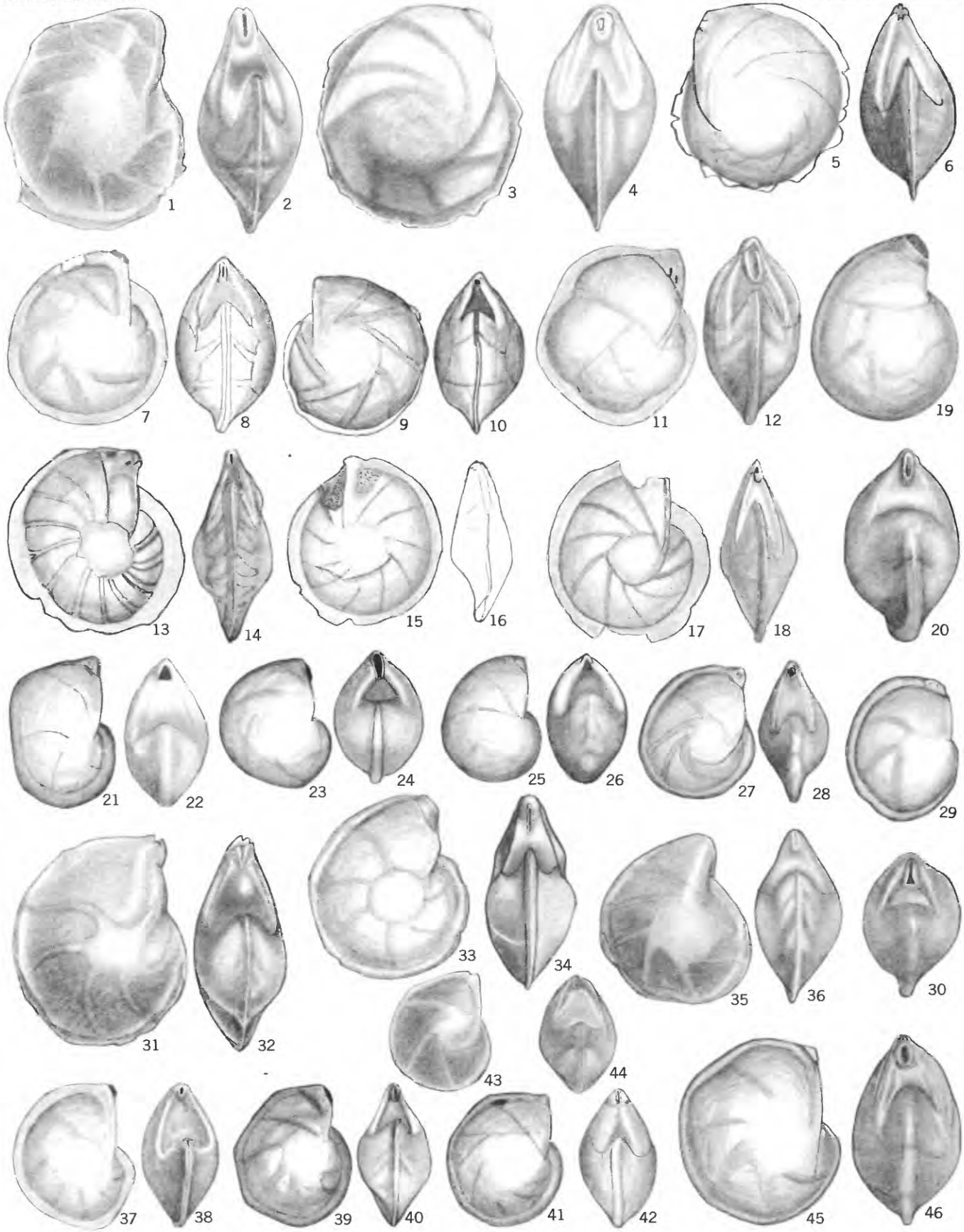


CRISTELLARIA AND *ROBULUS*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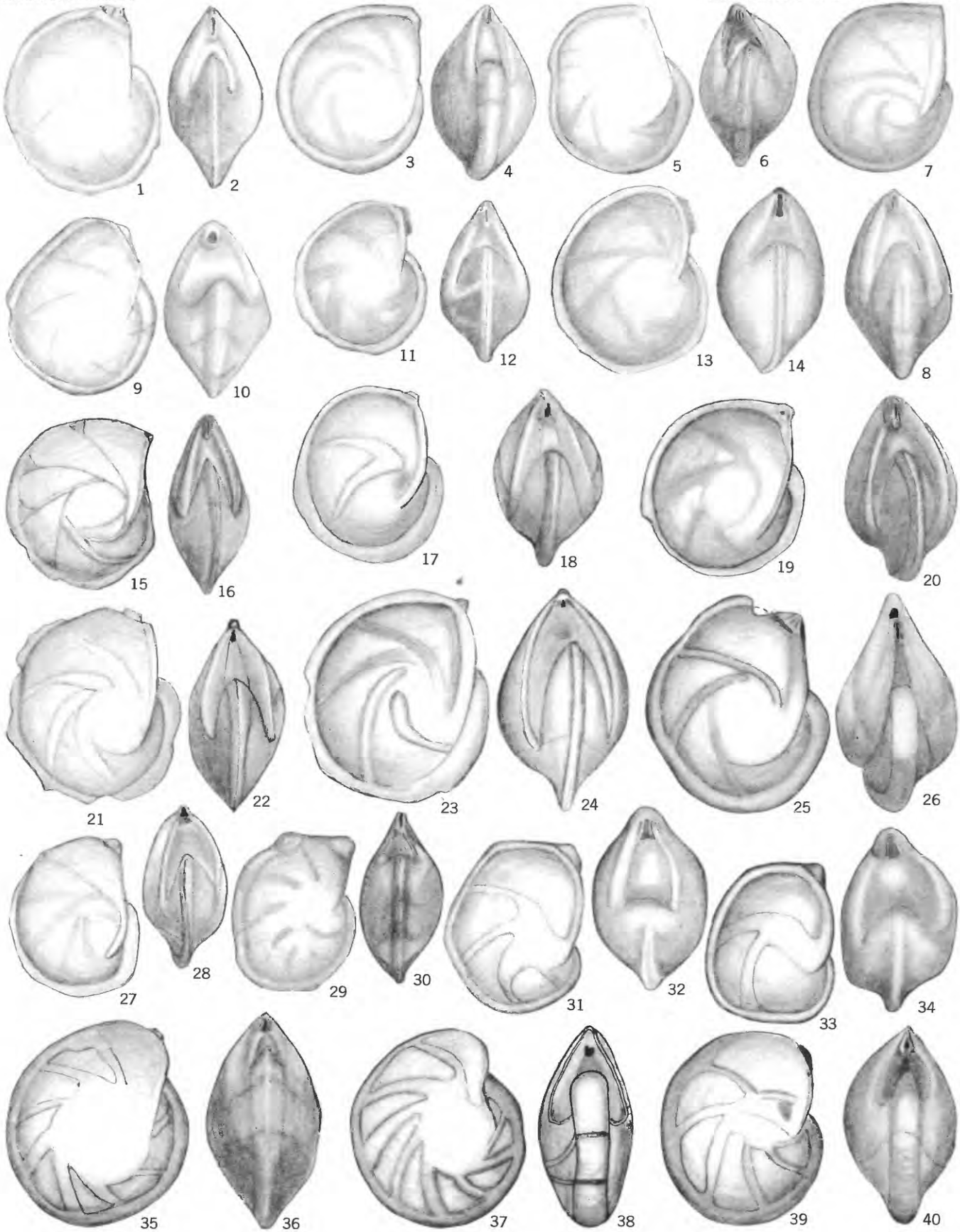
33, 34. USNM 549064, side and edge views, × 110.
35–40. *Robulus supralodoensis* Israelsky, n. sp. (p. 58)
35, 36. Holotype, USNM 549065, side and end views, × 52.
37, 38. Paratype, USNM 549066, side and end views, × 27.
39, 40. Paratype, USNM 549067, side and end views, × 61.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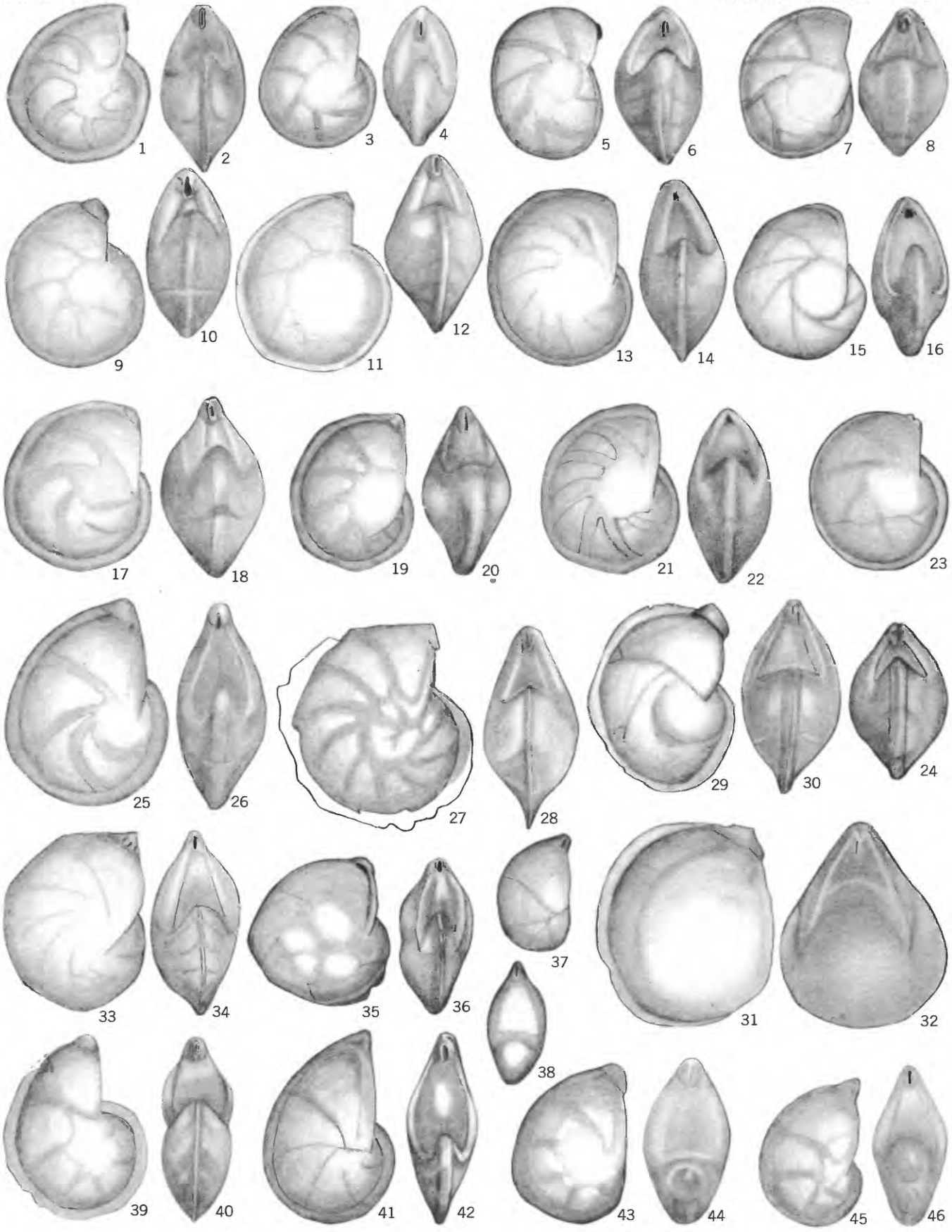
ROBULUS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ROBULUS

PLATE 17

FIGURES 1, 2. *Robulus* sp. BN. (p. 58)
USNM 549068, side and edge views, × 119.
3, 4. *Robulus* sp. BO. (p. 59)
USNM 549069, side and edge views, × 43.
5–8. *Robulus turpis* Israelsky, n. sp. (p. 59)
5, 6. Holotype, USNM 549070, side and edge views, × 38.
7, 8. Paratype, USNM 549071, side and edge views, × 121.
9, 10. *Robulus manifestus* Israelsky, n. sp. (p. 59)
Holotype, USNM 549072, side and edge views, × 61.
11, 12. *Robulus arcanus* Israelsky, n. sp. (p. 59)
Holotype, USNM 549073, side and edge views, × 82.
13, 14. *Robulus habilis* Israelsky, n. sp. (p. 60)
Holotype, USNM 549074, side and edge views, × 41.
15, 16. *Robulus* sp. BP. (p. 60)
USNM 549075, side and edge views, × 40.
17, 18. *Robulus* sp. BQ. (p. 60)
USNM 549076, side and edge views, × 160.
19, 20. *Robulus* sp. BR. (p. 60)
USNM 549077, side and edge views, × 160.
21, 22. *Robulus iracundus* Israelsky, n. sp. (p. 61)
USNM 549078, side and edge views, × 41.
23, 24. *Robulus inhabilis* Israelsky, n. sp. (p. 61)
Holotype, USNM 549079, side and edge views, × 41.
25, 26. *Robulus fatigatus* Israelsky, n. sp. (p. 61)
Holotype, USNM 549080, side and edge views, × 119.
27, 28. *Robulus cultus* Israelsky, n. sp. (p. 61)
Holotype, USNM 549081, side and edge views, × 55.
29–32. *Robulus ponderosus* Israelsky, n. sp. (p. 62)
29, 30. Holotype, USNM 549082, side and edge views, × 60.
31, 32. Paratype, USNM 549083, side and edge views, × 115.
33, 34. *Robulus* sp. BS. (p. 62)
USNM 549084, side and edge views, × 39.
35, 36. *Robulus pustulatus* Israelsky, n. sp. (p. 62)
Holotype, USNM 549085, side and edge views, × 75.
37, 38. *Robulus* sp. BT. (p. 62)
USNM 549086, side and edge views, × 117.
39, 40. *Robulus* sp. BU. (p. 62)
USNM 549087, side and edge views, × 145.
41, 42. *Robulus* sp. BV. (p. 63)
USNM 549088, side and edge views, × 115.
43, 44. *Robulus* sp. BW. (p. 63)
USNM 549089, side and edge views, × 117.
45, 46. *Robulus* sp. BX. (p. 63)
USNM 549090, side and edge views, × 118.

PLATE 18

FIGURES

1, 2. *Robulus* sp. BY. (p. 63)
USNM 549091, side and edge views, × 124.

3–4. *Robulus serenus* Israelsky, n. sp. (p. 64)
Holotype, USNM 549092, side and edge views, × 90.

5–8. *Robulus ligatus* Israelsky, n. sp. (p. 64)
5, 6. Holotype, USNM 549093, side and edge views, × 118.
7, 8. Paratype, USNM 549094, side and edge views, × 111.

9, 10. *Robulus frustratus* Israelsky, n. sp. (p. 64)
Holotype, USNM 549095, side and edge views, × 132.

11, 12. *Robulus* sp. BZ. (p. 65)
USNM 549096, side and edge views, × 124.

13, 14. *Robulus* sp. CA. (p. 65)
USNM 549097, side and edge views, × 117.

15, 16. *Robulus sp. CB.* (p. 65)
USNM 549098, side and edge views, × 122.

17, 18. *Robulus projectus* Israelsky, n. sp. (p. 65)
Holotype, USNM 549099, side and edge views, × 125.

19, 20. *Robulus* sp. CC. (p. 66)
USNM 549100, side and edge views, × 127.

21–26. *Robulus odiosus* Israelsky, n. sp. (p. 66)
21, 22. Holotype, USNM 549101, side and edge views, × 83.
23, 24. Paratype, USNM 549102, side and edge views, × 84.
25, 26. Paratype, USNM 549103, side and edge views, × 85.

27, 28. *Robulus tardus* Israelsky, n. sp. (p. 66)
Holotype, USNM 549104, side and edge views, × 113.

29, 30. *Robulus* sp. CD. (p. 66)
USNM 549105, side and edge views, × 40.

31, 32. *Robulus* sp. CE. (p. 67)
USNM 549106, side and edge views, × 59.

33, 34. *Robulus spasticus* Israelsky, n. sp. (p. 67)
Holotype, USNM 549107, side and edge views, × 59.

35, 36. *Robulus* sp. CF. (p. 67)
USNM 549108, side and edge views, × 73.

37, 38. *Robulus* sp. CG. (p. 67)
USNM 549109, side and edge views, × 99.

39, 40. *Robulus* sp. CH. (p. 67)
USNM 549110, side and edge views, × 71.

41, 42. *Robulus sanus* Israelsky, n. sp. (p. 68)
Holotype, USNM 549112, side and edge views, × 60.

43, 44. *Robulus* sp. CI. (p. 68)
USNM 549111, side and edge views, × 59.

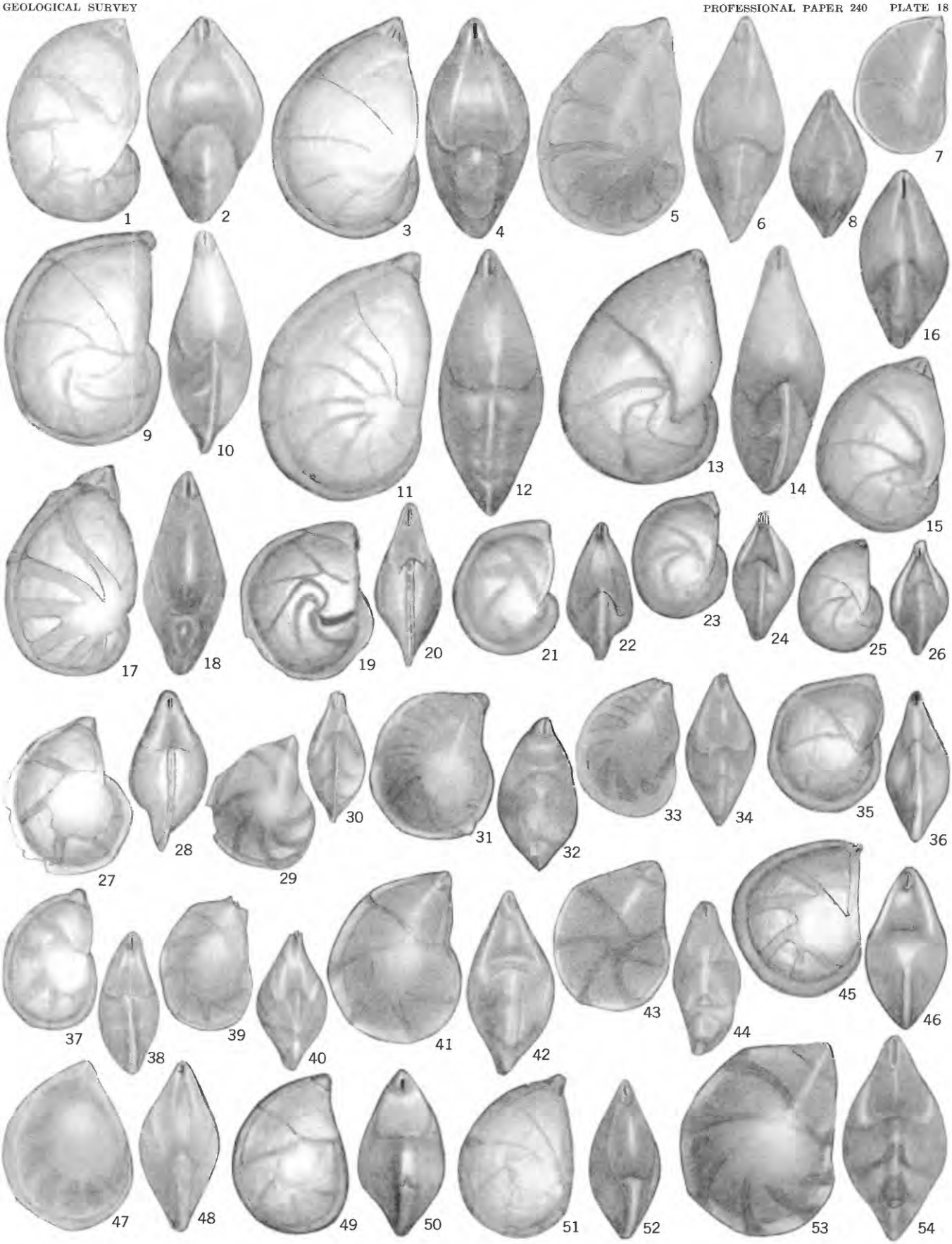
45, 46. *Robulus fractus* Israelsky, n. sp. (p. 68)
Holotype, USNM 549113, side and edge views, × 158.

47, 48. *Robulus roscidus* Israelsky, n. sp. (p. 68)
Holotype, USNM 549114, side and edge views, × 84.

49, 50. *Robulus volaticus* Israelsky, n. sp. (p. 69)
Holotype, USNM 549115, side and edge views, × 125.

51, 52. *Robulus transilis* Israelsky, n. sp. (p. 69)
Holotype, USNM 549116, side and edge views, × 81.

53, 54. *Robulus fresnoensis* Israelsky, n. sp. (p. 69)
Holotype, USNM 549117, side and edge views, × 83.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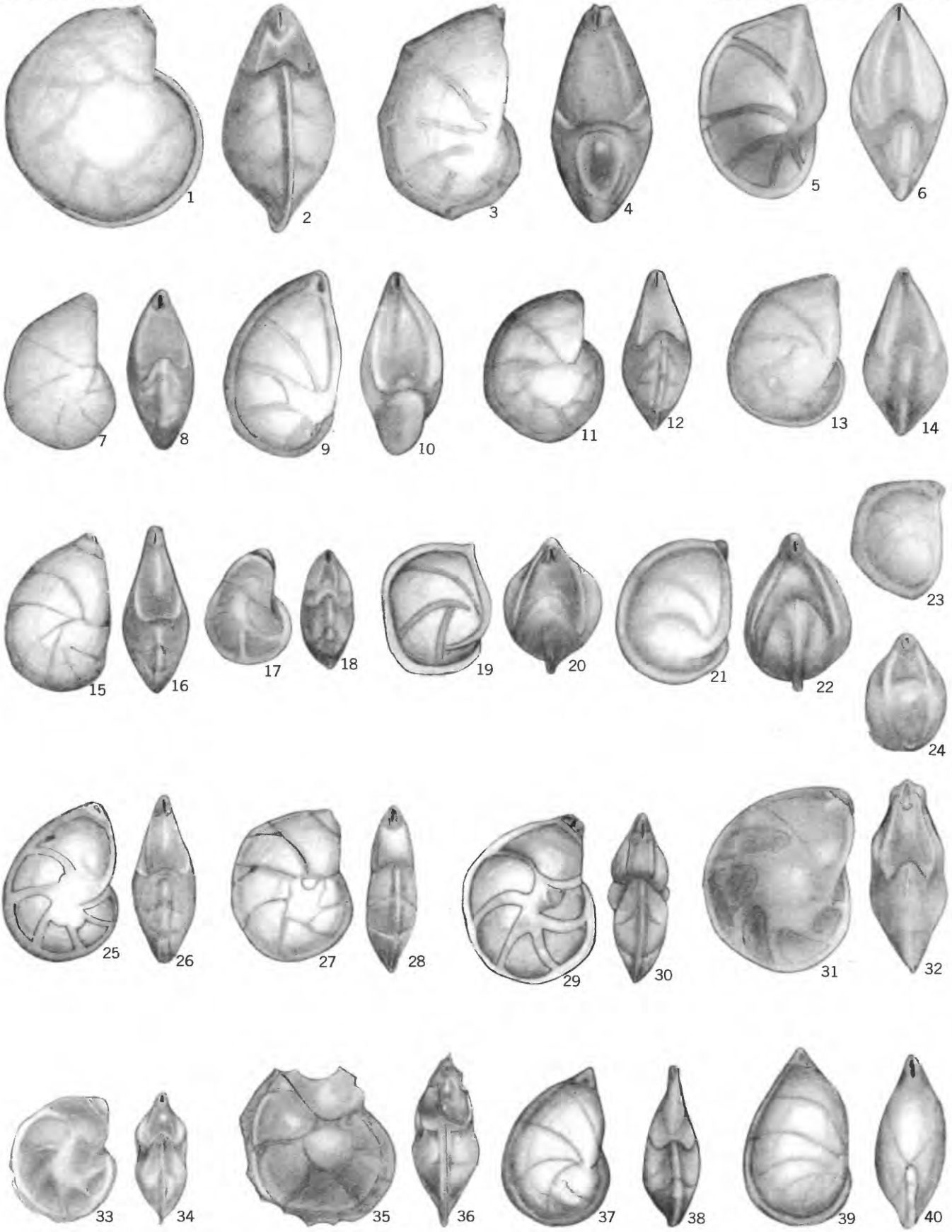
ROBULUS



ROBULUS AND *HEMIROBULINA*

PLATE 19

FIGURES

1, 2. *Robulus* sp. CJ. (p. 69)
USNM 549118, side and edge views, × 129.

3, 4. *Robulus* sp. CK. (p. 70)
USNM 549119, side and edge views, × 119.

5, 6. *Robulus* sp. CL. (p. 70)
USNM 549120, side and edge views, × 138.

7, 8. *Robulus* sp. CM. (p. 70)
USNM 549121, side and edge views, × 121.

9, 10. *Robulus* sp. CN. (p. 70)
USNM 549122, side and edge views, × 121.

11, 12. *Robulus* sp. CO. (p. 70)
USNM 549123, side and edge views, × 50.

13, 14. *Robulus* sp. CP. (p. 71)
USNM 549124, side and edge views, × 78.

15, 16. *Robulus* sp. CQ. (p. 71)
USNM 549125, side and edge views, × 61.

17, 18. *Robulus* sp. CR. (p. 71)
USNM 549126, side and edge views, × 78.

19, 20. *Robulus* sp. CS. (p. 71)
USNM 549127, side and edge views, × 41.

21, 22. *Robulus* sp. CT. (p. 72)
USNM 549128, side and edge views, × 61.

23, 24. *Robulus* sp. CU. (p. 72)
USNM 549129, side and edge views, × 134.

25, 26. *Robulus vatius* Israelsky, n. sp. (p. 72)
Holotype, USNM 549130, side and edge views, × 58.

27, 28. *Robulus plicatus* Israelsky, n. sp. (p. 72)
Holotype, USNM 549131, side and edge views, × 61.

29, 30. *Robulus loismartinae* Israelsky, n. sp. (p. 72)
Holotype, USNM 549132, side and edge views, × 58.

31–34. *Robulus interritus* Israelsky, n. sp. (p. 73)
31, 32. Paratype, USNM 549133, side and edge views, × 81.
33, 34. Holotype, USNM 549134, side and edge views, × 62.

35, 36. *Robulus ?* sp. CV. (p. 73)
USNM 549135, side and edge views, × 43.

37, 38. *Hemirobulina* sp. CW. (p. 73)
USNM 549136, side and edge views, × 82.

39, 40. *Hemirobulina* sp. CX. (p. 74)
USNM 549137, side and edge views, × 82.