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STENOLOBULITES N. GEN., EARLY PERMIAN ANCESTOR OF PREDOMINANTLY LATE PERMIAN PARAGASTRIOCERATID SUBFAMILY PSEUDOGASTRIOCERATINAE

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Abstract.—Paragastrioceratidae are amongst the most common and stratigraphically useful of Permian ammonoids. They originated as a rare element in the earliest Permian Asselian Age, maintained high abundance and diversity throughout the remainder of that Period, and declined to extinction in the earliest Triassic Griesbachian Age.

The subfamily Paragastrioceratinae, characterized by a ventral salient in the growth lines, is confined to the Lower Permian (Asselian through Baigendzhinian). Pseudogastrioceratinae comprise virtually all Upper Permian paragastrioceratids and are distinguished by a ventral sinus in the growth lines, commonly at the crest of a relict salient. Ancestry of these Late Permian forms was from the Early Permian *Stenolobulites* n. gen., derived from the paragastrioceratin genus *Svetlanoceras* in the early Sakmarian (Tastubian).

Representatives of all known species of *Stenolobulites* are described. The type species, *S. stenolobulus* n. sp., is from the Roadian of West Texas. *S. admiralensis* (Plummer and Scott, 1937), *S. subglobosus* n. sp., *S. depressus* n. sp., and *S.* n. sp. occur in the Sakmarian or Artinskian of Texas. *S. simulator* (Girty, 1910) and *S. sinuosus* n. sp. are from the Phosphoria Formation and equivalents (Roadian) of southwestern Wyoming and adjacent areas of Idaho and Utah.

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PARAGASTRIOCERATIDAE are representatives of the suborder Goniatitina that constitute one of the most common ammonoid groups throughout the Permian System (Glenister and Furnish, 1981). They are abundant from the basal Permian Asselian Stage (e.g., Ruzhentsev, 1952) into the uppermost Permian Changhsingian Stage (e.g., Zhao, Liang, and Zheng, 1978) and extend across the erathem boundary as a rare element in the basal Triassic Griesbachian Stage (Sheng et al., 1984). Although somewhat provincial, they are represented in all Permian ammonoid faunal realms. All possess simple, eight-lobed sutures, and separation into subfamilies is based primarily on the configuration of the growth lines, constrictions, or ribs as they cross the venter of post-juvenile growth stages.

One of the three subfamilies of the Paragastrioceratidae is the rare Atsabitinae (Furnish, 1966), characterized by thinly discoidal conch, wide umbilicus, and distinctively prominent, forwardly arched ribs. Only three species, assigned to two genera, are represented, and the group will not be considered further. The remaining subfamilies are diverse and abundant. Paragastrioceratinae (Ruzhentsev, 1951), the ancestral stock, is restricted to the Lower Permian (Asselian-Baigendzhinian) and characterized by a ventral salient in the constrictions or other growth features (e.g., Mikesh, 1968). Upper Permian paragastrioceratids display a shallow to deep hyponomic sinus across the venter, commonly in the crest of a salient, and are assigned to the Pseudogastrioceratinae (Furnish, 1966). Ancestry of this group, in the early Sakmarian (Tastubian Substage) was from a paragastrioceratin rootstock, the genus *Svetlanoceras* Ruzhentsev (1974). These ancestral pseudogastrioceratins are herein assigned to the new genus *Stenolobulites.* They are similar to *Svetlanoceras* in small size, discoidal conch form, and sutural contours but differ primarily in the presence of a ventral sinus at the crest of the salient in post-juvenile growth lines and constrictions (Mikesh and Glenister, 1985).

The purpose of the present study is to name *Stenolobulites,* to describe component species, and to demonstrate that the group represents the rootstock of the diverse latest Early Permian (Roadian) and Late Permian Paragastrioceratidae. *Stenolobulites* remained relatively rare throughout most of the Early Permian but diversified to become a common element of Roadian faunas. It gave rise to diverse pseudogastrioceratins in the Roadian (Fig. 1), becoming extinct before the earliest Late Permian (Wordian).

Symbols for shell parameters and sutural elements are those employed consistently in the authors' publications. Dimensions D, H, W, and U represent conch diameter, corresponding whorl height and width, and umbilical diameter from seam to seam. Sutural symbols V_1, *L,* and *U* refer to subdivisions (prongs) of the ventral lobe, the entire lateral lobe, and the entire umbilical lobe, respectively. Stage nomenclature for the Permian follows Furnish (1973) and Glenister (1981). Designations for repository collections are: SUI (Department of Geology, The University of Iowa), UT (University of Texas at Austin), and USNM (United States National Museum of Natural History).

Critically important study specimens have been received on exchange from the late Professor V. E. Ruzhentsev, Paleontologicheskogo Instituta, Akademia Nauk, SSSR. Large collections from West Texas were assembled by R. W. Moyle (Weber State College) and analyzed in his doctoral dissertation (Moyle, 1963). G. A. Cooper and R. E. Grant (United States National Museum) guided the Iowa group in West Texas and provided access to their ammonoid collections. We have benefited from discussions with our colleague, Zhou Zuren (Nanjing Institute of Geology and Palaeontology). David L. Schwarz (Iowa) assisted in preparation of the manuscript. Data collection was facilitated by the National Science Foundation (GB-5530).

SYSTEMATIC PALEONTOLOGY

Genus STENOLOBULITES new genus

Type species.—*S. stenolobulus* n. sp.; original designation.

Diagnosis.—Ancestral pseudogastrioceratins in which many of the diagnostic primitive features are at least partially a function of small size (commonly 25–30 mm at maturity). Conch thinly subdiscoidal to thickly subglobose (W/D, 0.45–0.9) with depressed to equidimensional whorls (H/W, 0.35–0.8) and a U/D ratio of

0.25–0.6. Shell sculpture is generally dominated by longitudinal strigae. Short umbilical ribs are present, almost invariably, on early ontogenetic stages, and may persist as a prominent feature to maturity. Delicate growth striae, and constrictions on the internal mold, form an

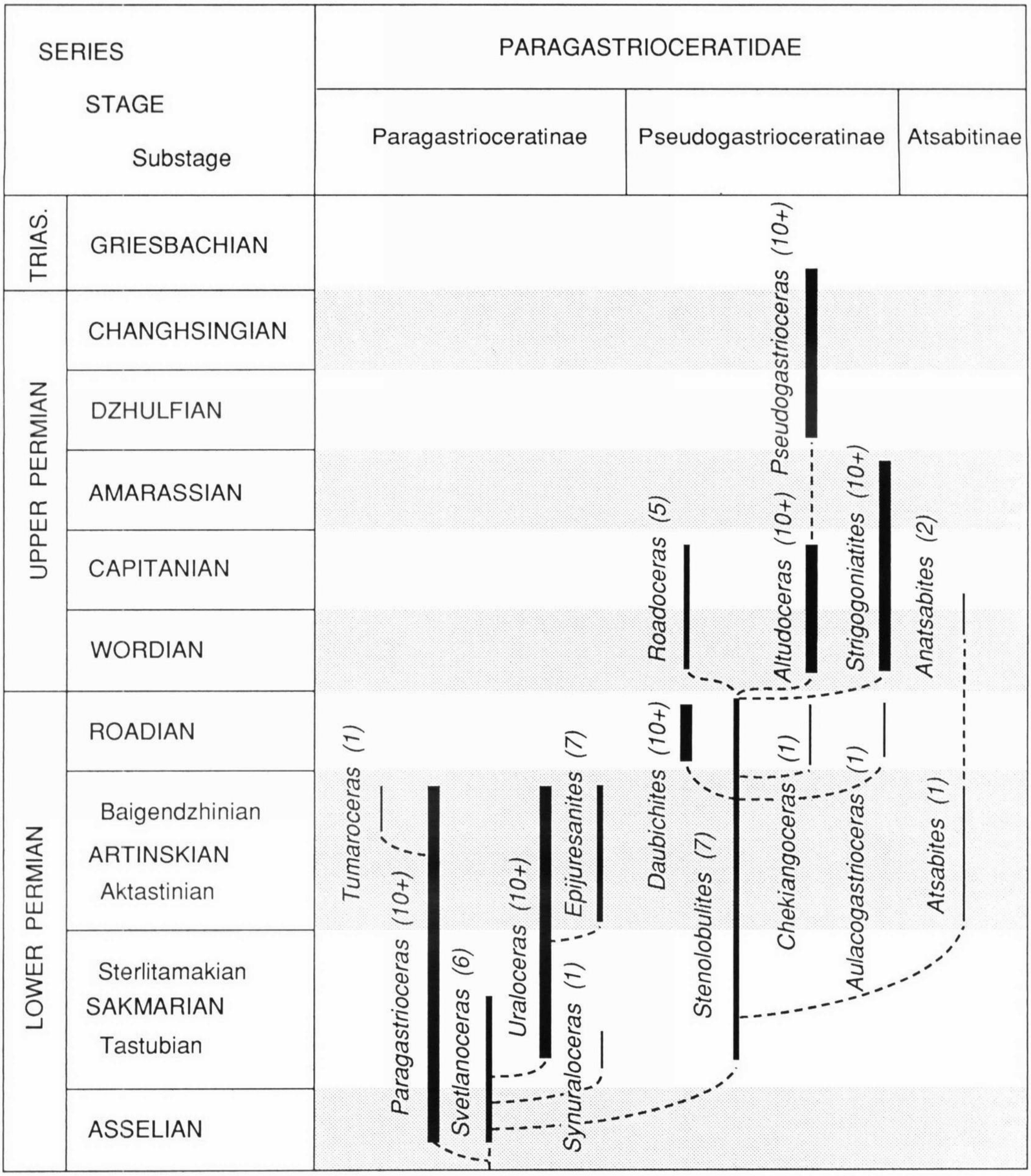

Fig. 1. Stratigraphic distribution of genera included in the three paragastrioceratid subfamilies: Paragastrioceratinae, Pseudogastrioceratinae, and Atsabitinae. Numbers in parenthesis following generic names are component species recognized by the present authors; some species included in the counts remain to be described and named. Thickness of generic range lines is a gross reflection of total specific diversity. Broken lines suggest phyletic derivation.

indistinct to pronounced ventral sinus in the overall prorsiradiate trace of these features; magnitude of this sinus is accentuated as part of the mature modification.

The mature suture is characterized by bilateral symmetry of both the ventral prongs and the lateral lobe. Flanks of the ventral lobe are subparallel, with the tip located in the plane of element symmetry, but the lateral lobe may flare adorally in unconstricted divergent flanks. Width ratio V_1/L (prongs of the ventral lobe/lateral lobe) is less than 0.6. In virtually all cases, lobe bases are uniformly rounded and lack significant attenuation.

The generic name refers to the narrow small prongs of the ventral lobe.

Discussion.—Derivation of *Stenolobulites* was from *Svetlanoceras* Ruzhentsev, 1974:23 (type species, *Uraloceras serpentinum* Maximova, 1948:7; original designation), the common rootstock (Asselian-Sakmarian) of the Paragastrioceratinae and Pseudogastrioceratinae (Fig. 1). Both genera are small (usually less than 30 mm) and display narrow prongs and subparallel flanks of the ventral lobe. Harbinger of divergence of the two subfamilies is the presence of a shallow ventral sinus in the growth lines of *Stenolobulites.* Greater mature size was achieved by some latest Early Permian (Roadian) species, one of which (*S. sinuosus* n. sp.) is known to approach 80 mm in diameter. Concomitant with the Roadian achievement of greater size, the *Stenolobulites* rootstock diversified to produce the ubiquitous *Daubichites* Popow, 1963:149 (type species, *D. orientalis*; original designation), and the bizarre South China endemics *Aulacogastrioceras* Zhao and Zheng, 1977:240 (type species, *A. spinosum*; original designation) and *Chekiangoceras* Ruzhentsev, 1974:24 (type species, *C. carinatum*; original designation). All Early Permian pseudogastrioceratins, including *Stenolobulites,* were replaced across the series boundary by distinctive Late Permian taxa (Fig. 1). Strong asymmetry of the prongs of the ventral lobe is the most consistent characteristic of these Late Permian forms [*Altudoceras* Ruzhentsev, 1940: 286 (type species, *Gastrioceras altudense* Böse, 1919:88; original designation), *Roadoceras* Zhou 1985:195 (type species, *Gastrioceras roadense* Böse, 1919:85; original designation), *Strigogoniatites* Spath, 1934:15 (type species, *Glyphioceras angulatum* Haniel, 1915:51; original designation), and *Pseudogastrioceras* Spath, 1930:8 (type species, *Goniatites Abichianus* Möller, 1879: 230; monotypy)]. Additionally, all exceed *Stenolobulites* in mature size (some exceed 20 cm), and all have broader prongs in the mature suture (V_1/L greater than 0.6, commonly 0.75-1.0). Figure 3,*4* [*Daubichites brevicostatus* (Miller and Cline, 1934), Roadian of Idaho] is illustrated as an example of an Early Permian derivative of *Stenolobulites,* and Figure 7,*5a,b* (*Strigogoniatites kingi* Miller, 1944, Capitanian of Mexico) represents Late Permian descendants.

Composition and Distribution.—All known species of *Stenolobulites* are described in the following text. The type species, *S. stenolobulus* n. sp., from the uppermost Lower Permian (upper Roadian) of West Texas is considered first. Arrangement of succeeding specific descriptions of named species follows in approximate stratigraphic order, beginning with *S. admiralensis* (Plummer and Scott, 1937), from the Sakmarian of west-central Texas, and concluding with *S. simulator* (Girty, 1910) and *S. sinuosus* n. sp., from the Roadian of southwestern Wyoming and adjacent areas of Idaho and Utah.

STENOLOBULITES STENOLOBULUS new species

Figures 2,*2a-e*; 3,*3a-c*; 4; 5; Table 1

Diagnosis.—A relatively thinly subdiscoidal species of *Stenolobulites* (W/D, 0.45-0.5) with

Fig. 2. Lower Permian *Stenolobulites.*——*1a-g. Stenolobulites depressus* n. sp., Cathedral Mountain Formation (Artinskian) along N and W slope of Hill 4861, 4.8 km NW of Dugout Mountain, Catto-Gage Ranch, Brewster County, West Texas (vicinity of USNM loc. 732u); *a,b,* holotype SUI 32674, ×1.25; *c-e,* paratype SUI 32675, ×2; *f,g,* paratype SUI 32701, ×2 (see also Fig. 7,*4*).——*2a-e. Stenolobulites stenolobulus* n. sp., upper Road Canyon Formation, 5.5 km NW of the crest of Dugout Mountain, Brewster County, West Texas (USNM loc. 732z); *a,b,* holotype SUI 32663, ×2.5; *c-e,* paratype SUI 32664, ×3 (see also Fig. 3,*3a-c*).——*3a,b. Stenolobulites simulator* (Girty), hypotype SUI 711, Meade Peak Member of the Phosphoria Formation (Roadian), S wall of Raymond Canyon, W flank of Sublette Range, Lincoln County, southwestern Wyoming, ×2 (see also Fig. 7,*3a-g*).

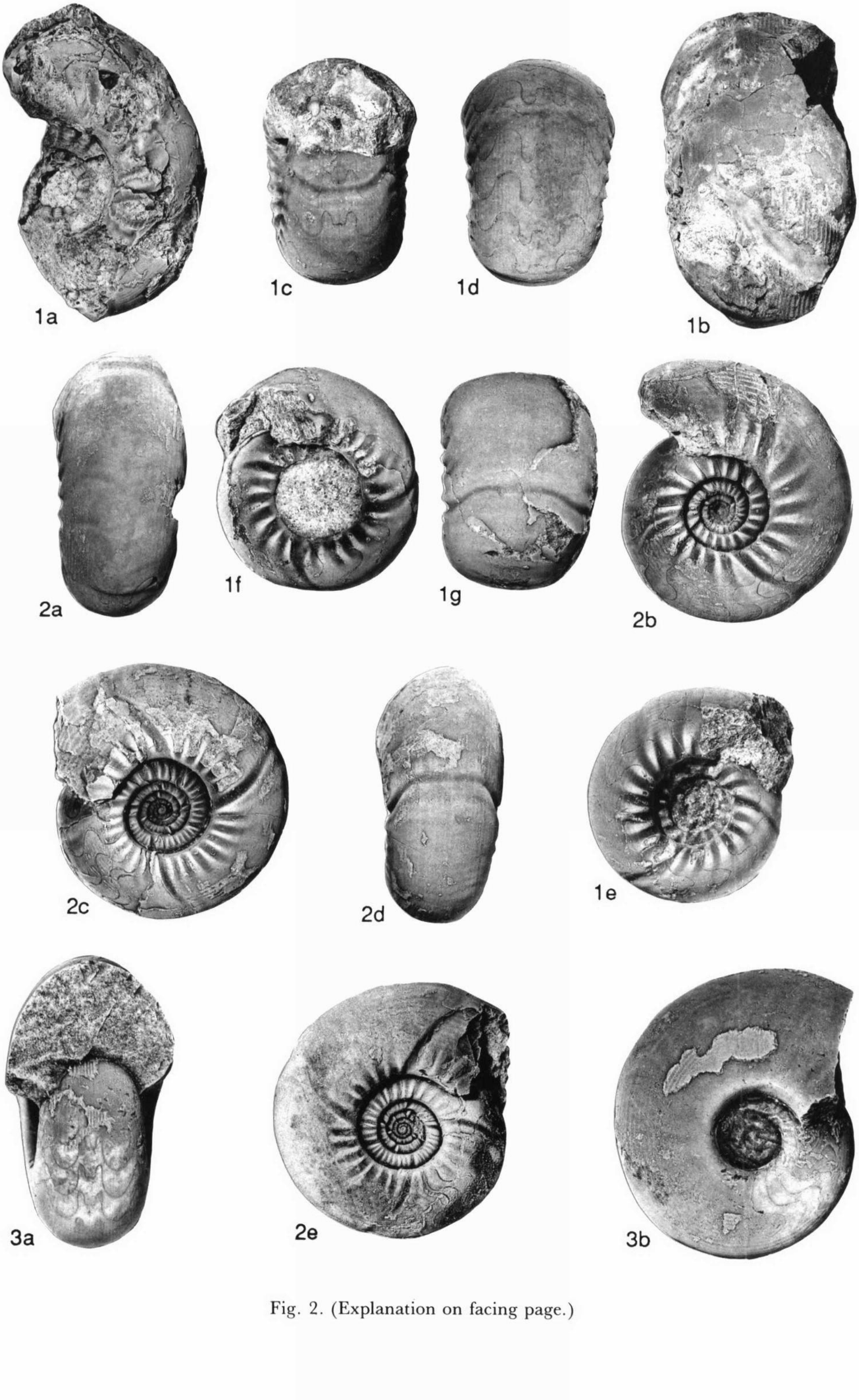

Fig. 2. (Explanation on facing page.)

Table 1. *Diameters (mm) and corresponding conch proportions of species of* Stenolobulites *n. gen. Species are arranged in approximate stratigraphic order, with the oldest at the bottom. Symbols used are: D (conch diameter), and corresponding H (height of whorl), W (width), and U (umbilical diameter, maximum, measured from seam to seam). Asterisks indicate approximate measurement.*

	D	H/D	W/D	U/D	H/W
S. stenolobulus n. sp.					
Paratype SUI 52583	25.0	0.39	0.49	0.40*	0.71
Paratype SUI 32673	24.0	0.33	0.46	0.38	0.73
Holotype SUI 32663	16.0	0.38	0.50	0.38	0.75
Paratype SUI 32664	12.7	0.37	0.47	0.35	0.78
Paratype SUI 32668	9.5	0.37	0.53	0.32	0.70
Paratype SUI 32669	7.5	0.40	0.53	0.40	0.75
Paratype SUI 32666	1.2	0.33	0.63	0.42	0.53
S. sinuosus n. sp.					
Holotype SUI 32705	50.0	0.46	0.48	0.25	0.96
Holotype SUI 32706	38.0	0.47	0.53	0.26	0.90
Paratype SUI 32707	30.0	0.43	0.50	0.30	0.87
Paratype SUI 5989	20.0	0.40	0.55	0.30	0.73
Paratype SUI 32708	15.0	0.43	0.60	0.30	0.72
Paratype SUI 32709	5.5	0.40	0.73	0.29	0.55
S. simulator (Girty)					
Hypotype SUI 711	21.7	0.44	0.55	0.26	0.80
Hypotype SUI 32736	17.5	0.44	0.57	0.26	0.77
Hypotype SUI 32714	15.5	0.45	0.60	0.26	0.75
Hypotype SUI 32718	14.5	0.47	0.57	0.26	0.83
Hypotype SUI 32715	12.0	0.40	0.61	0.28	0.66
Hypotype SUI 32721	10.0	0.47	0.64	0.24	0.73
Hypotype SUI 32733	7.0	0.36	0.61	0.29	0.58
Hypotype SUI 32716	5.8	0.40	0.69	0.28	0.58
Hypotype SUI 32735	3.0	0.33	0.73	0.33	0.45
S. n. sp. (West Texas and Guatemala)					
W. Reserve U. G-67-1	15.0	0.27	0.47	0.57	0.57
SUI 32737 USNM loc. 707b	11.7	0.30	0.50	0.55	0.60
S. depressus n. sp.					
Holotype SUI 32674	28*	0.36	0.71	0.36	0.50
Paratype SUI 32675	16.5	0.33	0.69	0.42	0.48
Paratype SUI 32701	16.0	0.34	0.72	0.41	0.48
Paratype USNM 424899	12.7	0.32	0.71	0.47	0.44
Paratype SUI 32702	11.0	0.27	0.73	0.45	0.38
S. subglobosus n. sp.					
Holotype SUI 10702	21.0	0.43	0.76	0.29	0.56
Paratype SUI 10706	12.0	0.46	0.67	0.27	0.69
Paratype USNM 424900	10.5	0.38	0.67	0.33	0.57
Paratype SUI 2032	8.7	0.40	0.69	0.40	0.58
Paratype SUI 2031	7.0	0.43	0.83	0.36	0.52

depressed whorls (H/W, about 0.75), moderately large ribbed umbilicus (U/D, 0.3–0.4) and constrictions that trace a faint hyponomic sinus across the crest of a high ventral salient. The mature suture is characterized by a symmetrical, nonattenuate, parallel-sided first lateral lobe that is approximately twice as wide as each prong of the ventral lobe.

Description.—*Stenolobulites stenolobulus* is based upon ten complete specimens and seven fragments from the Road Canyon Formation (type Roadian) and one additional specimen from the upper Bone Spring Limestone, both of West Texas. In general, the specimens are well preserved; however, those individuals preserved in shale as limonitic internal molds exhibit finer morphologic and sutural detail than most of the limestone specimens secured from dense carbonates. The largest limonitic specimen (holotype SUI 32663, Fig. 2,*2a,b*) displays five visible outer volutions and at 16 mm diameter consists of the mature phragmocone and about one-half volution of body chamber; the innermost whorls and protoconch are not preserved. Crowding of the ultimate and penultimate sutures suggests that the holotype is mature. The single specimen from the Bone Spring Limestone (paratype SUI 52583) is even larger than the holotype, and septal approximation suggests that it too is mature. The phragmocone of this specimen achieves a diameter of 17 mm, and, with a full volution of body chamber, the mature conch diameter is 25 mm. The umbilicus of paratypes SUI 32664 (Fig. 2,*2c–e*), 32665, and 32666 is open, and the protoconch is visible. Conch diameters and proportions of selected types are listed in Table 1.

Numerous fine longitudinal strigae, impressed on the internal mold, are closely spaced across the venter but become progressively more widely spaced toward the umbilical shoulder; no strigae occur directly on the umbilical shoulder and wall. Transverse constrictions and less conspicuous growth lamellae outline a broad but shallow hyponomic sinus across the crest of a high overall salient. Constrictions average four per volution at mature conch diameters. Ribs, narrowly rounded and forwardly arched, trend from the ventral margin of the umbilical wall across a broadly rounded umbilical shoulder and onto the dorsolateral flanks. They are present in all growth stages and have a density ranging between 20 and 25 per volution at conch diameters exceeding 7 mm. A shallow but distinct longitudinal groove extends along the umbilical wall adjacent to the dorsal termination of the umbilical ribs.

Figure 5 illustrates selected external sutures of the holotype and two paratypes. The V_1/L ratio is approximately 0.5; both of these sutural elements are nearly symmetrical and nonattenuate throughout the full range of ontogeny.

Discussion.—The type species of *Stenolobulites* can be distinguished from most other congeners in possession of a moderately large ribbed umbilicus and relatively thinly subdiscoidal conch shape (Table 1, Fig. 4). *S. sinuosus* n. sp. and *Stenolobulites* n. sp. most nearly resemble *S. stenolobulus* in possession of a subdiscoidal conch and prominent umbilical ribs, but several features permit differentiation. *S. stenolobulus* developed a markedly wider umbilicus and proportionately more strongly depressed whorls than *S. sinuosus*. Additionally, the constrictions in the type species are virtually transverse across the venter, whereas a deep ventral sinus is present in *S. sinuosus*. *Stenolobulites* n. sp. has a wide umbilicus (U/D exceeds 0.55), whereas *S. stenolobulus* exhibits a proportionately smaller umbilicus and only moderately depressed whorls.

Sutures of only two congeners, *S. sinuosus* n. sp. (see Fig. 10) and *S. simulator* (see Fig. 9), resemble those of the type species (Fig. 5) closely enough to warrant comparative evaluation. At diameters less than 20 mm, the immature sutures of both species display elements V_1 and L that are symmetrical and devoid of apical attenuation, separated by a broad first lateral saddle; in all these features, they resemble *S. stenolobulus*. However, the flanks of L diverge adorally in *S. sinuosus*, and element U is appreciably attenuate; in contrast, L is parallel-sided and U lacks attenuation in the type species. In *S. simulator* element V_1 is only about one-third the width of L, and the latter element exhibits oblique flanks that diverge adorally; the width ratio V_1/L in *S. stenolobulus* approximates 0.5.

The specific name refers to the proportionate size of the ventral prongs and the first lateral lobe.

Occurrence.—All known representatives of *Stenolobulites stenolobulus*, with the exception of SUI 32670 and 52583, were secured from shales in the upper part of the Road Canyon Formation on slopes below the crest of Hill 4893, 5.5 km (3.4 miles) NW of the crest of Dugout Mountain, Brewster County, West Texas (Dugout Mountain Quadrangle, 1983; 30°14.35′N, 103°27.1′W). This corresponds to USNM locality 732z of Cooper and Grant (1972). Paratype SUI 32670 was collected from

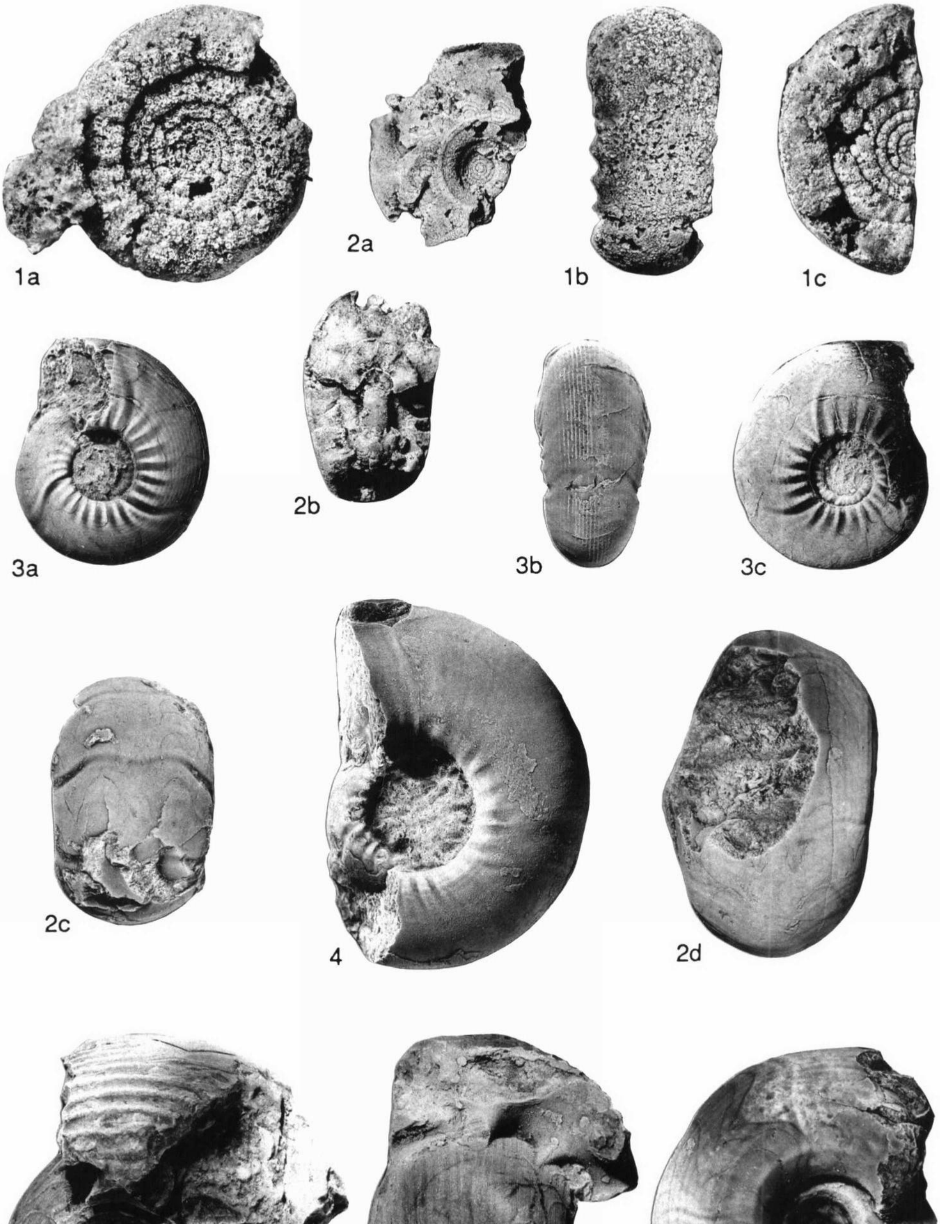

Fig. 3. (Explanation on facing page.)

the main escarpment about 1.6 km (1 mile) S of the crest of Gilliland Peak in Gilliland Canyon, 3.2 km (2 miles) SW of BM 4973 (Gilliland Peak Quadrangle, 1983). This corresponds to USNM locality 724f of Cooper and Grant (1972). Paratype SUI 52583 was collected by Claude Spinosa (Boise State University) from the upper Bone Spring Limestone at a road cut on the W side of US Highway 62/180, just NE of BM 4367, 2.9 km (1.8 miles) NE of the junction with Texas 54, Culberson County, West Texas (Guadalupe Pass Quadrangle, 1973; 31°49.1'N, 104°49.8'W).

Repository.—Holotype SUI 32663, paratypes 32664-32670, 32671 (a, b), 32672 (6 fragments), 32673, 52583.

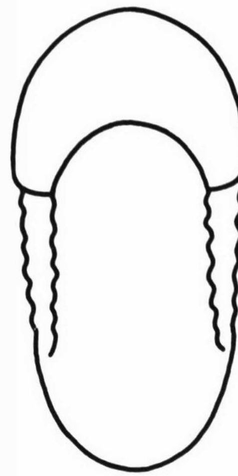

Fig. 4. Apertural profile of *Stenolobulites stenolobulus* n. sp., Road Canyon Formation (Roadian), 5.5 km NW of the crest of Dugout Mountain, Brewster County, West Texas (USNM loc. 732z); holotype SUI 32663, D 15 mm.

STENOLOBULITES ADMIRALENSIS (Plummer and Scott, 1937)

Figures 3,*5a,b*; 6,*A*

Paragastrioceras admiralense Plummer and Scott, 1937:223, pl. 22, figs. 1-9. Ruzhentsev, 1951:140. Nassichuk, Furnish, and Glenister, 1965:17.

Pseudogastrioceras admiralense (Plummer and Scott). Miller and Furnish, 1940:20. Miller and Youngquist, 1947:10-11.

Diagnosis.—A globose species of *Stenolobulites* (W/D, about 0.9) with wide umbilicus (U/D, about 0.4) and strongly depressed whorls (H/W less than 0.4). Ornament is dominated by coarse strigae, and transverse features are grossly subordinate.

Description.—Holotype UT P851 and paratype UT 34481 represent the only specimens known to be referable to *Stenolobulites admiralensis*. Both are poorly preserved, incomplete, immature phragmocones lacking any trace of the body chamber; they supplement each other in preservation of the sutures and conch ornament. Poor preservation and damage during previous preparation limit accuracy achievable for conch measurement and sutural representation. At a diameter of 14.5 mm the penultimate volution of the holotype has a height of 5 mm, width of 13 mm, and umbilical diameter of 6 mm.

Approximately 70 fine longitudinal strigae occur on the external shell surface at diameters less than 10 mm. Strigae decrease in density at larger sizes as relief increases progressively; less

Fig. 3. Lower Permian *Stenolobulites,* and *Daubichites* for comparison.——*1a-c. Stenolobulites* n. sp.; *a,* Stehli collection G-67-1, Chocal Formation (upper Artinskian), western Guatemala, near border with Chiapas, Mexico, ×2.5; *b,c,* SUI 32737, Sullivan Peak Member of the Skinner Ranch Formation (upper Artinskian), Glass Mountains, West Texas (USNM loc. 707b), ×3.——*2a-e. Stenolobulites subglobosus* n. sp.; *a,b,* paratype SUI 32738, lower Hueco Formation (lower Sakmarian), southern Hueco Mountains, Hudspeth County, West Texas (Moyle loc. 202a), ×2.5; *c,* paratype SUI 10704, upper Lenox Hills Formation (lower Sakmarian), 9 m below base of the Skinner Ranch Formation, S of top of Dugout Mountain, Brewster County, West Texas, ×2; *d,e,* holotype SUI 10702, same horizon and locality as *c,* ×2 (see also Fig. 7,*2a,b*).——*3a-c. Stenolobulites stenolobulus* n. sp., paratype SUI 32667, upper Road Canyon Formation, 5.5 km NW of the crest of Dugout Mountain, Brewster County, West Texas (USNM loc. 732z), ×3.5 (see also Fig. 2,*2a-e*).——*4. Daubichites brevicostatus* (Miller and Cline), paratype SUI 32729, Meade Peak Member of the Phosphoria Formation (Roadian), S side US 89, 5.3 km E of Montpelier, Bear Lake County, SE Idaho, ×2.——*5a,b. Stenolobulites admiralensis* (Plummer and Scott), holotype UT P851, Admiral Formation (lower Sakmarian), 7.9 km SSW of Coleman, Coleman County, west-central Texas, ×2.

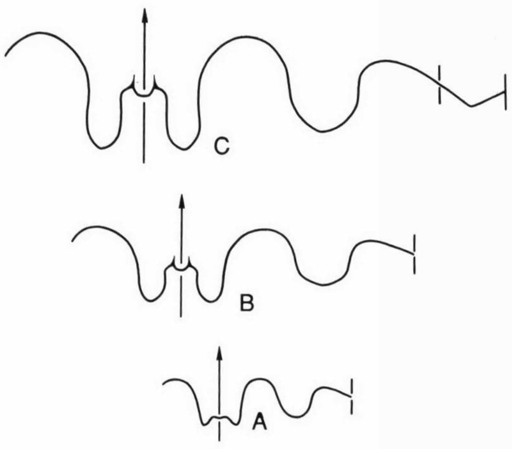

Fig. 5. Diagrammatic representation of external sutures of *Stenolobulites stenlobulus* n. sp., Road Canyon Formation (Roadian), 5.5 km NW of the crest of Dugout Mountain, Brewster County, West Texas (USNM loc. 732z); *A*, paratype SUI 32666, D 1 mm; *B*, paratype SUI 32665, D 7 mm, H 3 mm; *C*, holotype SUI 32663, D 12 mm, H 4.5 mm, W 6 mm.

than 30 coarse strigae occur across the ultimate volution of the holotype (Fig. 3,*5a,b*). Faint growth striae and virtually transverse constrictions outline a shallow hyponomic sinus flanked by broadly rounded, low, ventrolateral salients. Three constrictions per volution occur in the holotype. Both the holotype and the paratype exhibit a raised umbilical shoulder apparently the result of shell thickening; this low ridge produces a slight ''lip'' bordering the outer margin of a smooth umbilical wall. Nearly indiscernible short ribs occur across the umbilical shoulder of the paratype at approximately 10 mm shell diameter.

Details of the sutural contours have been destroyed by previous preparation, but the general form is portrayed by Fig. 6,*A*. Width ratios of sutural elements V_1/L approach 0.5 at 13 mm conch diameter. The lateral and ventral lobes are separated by a low, broad saddle.

Discussion.—Development of a ventral sinus and absence of dorsolateral nodes preclude assignment of the species to *Paragastrioceras,* whereas both the suture and the biconvex pattern of the growth lines characterize *Stenolobulites*. The only species closely resembling *S. admiralensis* in conch morphology and general form of the suture is *S. subglobosus* n. sp.; however, *S. admiralensis* possesses a proportionately more depressed whorl section and larger umbilicus (Table 1), and its ventral lobe has an unconstricted, low, median saddle (contrast Fig. 6,*A* with Fig. 6,*B, C*). The depressed outer whorls of *S. admiralensis* show approximately the same proportions as the innermost whorls of *S. subglobosus* n. sp. In addition, the presence of coarse longitudinal strigae and biconvex growth lines and constrictions is common to both species. *S. stenolobulus* n. sp. and *S. sinuosus* n. sp. differ from *S. admiralensis* in possession of more nearly equidimensional whorl sections and prominent umbilical ribs. *S. depressus* n. sp. can be distinguished from *S. admiralensis* by the development of prominent umbilical ribs, by more numerous strigae, and by constrictions and growth striae that are broad and shallow, virtually transverse. *S. simulator* (Girty) exhibits a smaller umbilicus and more nearly equidimensional whorls than *S. admiralensis*.

The sutures of *S. admiralensis* closely resemble those of *S. subglobosus* n. sp. Both of these taxa exhibit a wide and broadly rounded lateral saddle with an almost vertical ventral flank and a gently sloping, slightly sinuous dorsal flank. However, the width ratio of sutural elements V_1/L is greater in *S. admiralensis,* and the ventral prongs are less attenuate and more divergent than in *S. subglobosus* n. sp.

The trivial name refers to the stratigraphic occurrence.

Occurrence.—The holotype and paratype were secured from USGS locality 9802, in association with abundant ammonoids. This locality exposes nodular argillaceous limestone in the Wildcat Creek Shale Member (also known as Indian Creek Shale) of the Admiral Formation, about 4.5 m (15 feet) below the Overall Limestone Member. It is 7.9 km (4.9 miles) SSW of the center of Coleman, Coleman County, west-central Texas (Coleman Quadrangle, 1963), in an excavation for a stock tank on a low divide 0.8 km (0.5 miles) E of the curve in US Highway 67 and 75 m (250 feet) S of the Santa Fe Railroad right-of-way. The Wildcat Creek Shale Member corrrelates with the Lenox Hills Formation (lower Sakmarian Tastubian Substage) of West Texas; both yield *Properrinites boesei* (Plummer and Scott, 1937; Tharalson, 1984).

Repository.—Holotype UT P851, paratype UT 34481.

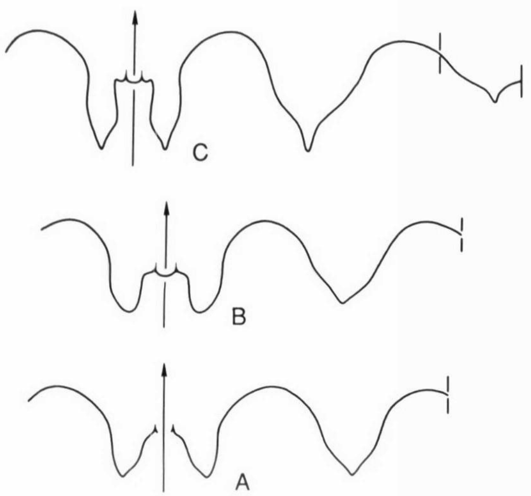

Fig. 6. Diagrammatic representation of external sutures of *Stenolobulites; A, S. admiralensis* (Plummer and Scott), Admiral Formation (lower Sakmarian), Coleman County, west-central Texas; holotype UT P851, D 13 mm, H 4.5 mm; *B, S. subglobosus* n. sp., Lenox Hills Formation (lower Sakmarian), S of the top of Dugout Mountain, Brewster County, West Texas; paratype USNM 424900, D 7 mm, H 2.5 mm; *C, S. subglobosus* n. sp., Lenox Hills Formation (lower Sakmarian), S of the top of Dugout Mountain, Brewster County, West Texas; holotype SUI 10702, D 16 mm, H 8 mm, W 12 mm.

STENOLOBULITES SUBGLOBOSUS
new species

Figures 3,*2a–e*; 6,*B,C*; 7,*2a,b*; Table 1

Eoasianites modestus (Böse, 1919)? Miller and Furnish, 1940:80–81, pl. 12, fig. 4 [*non* figs. 5–9], pl. 13, fig. 7.

Diagnosis.—A species of *Stenolobulites*, distinguishable from congeners by combination of a thickly subglobose conch (W/D, 0.65–0.75), angular umbilical shoulders devoid of distinct ribs in all growth stages, and a wide and deeply attenuate first lateral lobe (V_1/L, 0.35) that is broadly expanded adorally.

Description.—Included within *Stenolobulites subglobosus* are five well-preserved internal molds and seventeen silicified shells. Two additional specimens previously referred with question to *Eoasianites modestus* are also included. Holotype SUI 10702 is a virtually complete phragmocone to which is attached one quarter volution of body chamber (Fig. 3,*2d,e*); crowding of the last two septa, and divergence of the ultimate one-third volution suggest maturity. Many of the silicified specimens exhibit details of the inner volutions down to the protoconch. The initial three or four volutions are widely evolute and narrowly discoidal. With development of the fourth or fifth volution (Fig. 3,*2a,b*), the whorl section widened abruptly, whorls became correspondingly depressed and the conch subglobose (W/D, 0.7), and a relatively involute condition was maintained into maturity (Table 1).

Numerous fine longitudinal strigae occur on early volutions (approximately 80 on paratype USNM 424900 at 10 mm diameter); they became progressively wider and decreased in number as maturity was approached (30 on the ultimate volution of the holotype, Fig. 3,*2d,e*). These strigae are present over the entire conch surface, with the exception of the umbilical shoulder and wall. Sinuous transverse constrictions, growth striae, and faint growth lamellae outline a shallow ventral sinus flanked by low, broadly rounded, ventrolateral salients. Four to five constrictions per volution are deeply incised on inner volutions (diameter 10 mm) but are progressively less conspicuous at larger sizes. Paratype USNM 424900 exhibits a raised subangular ridge, along the umbilical shoulder, which protrudes slightly over the outer margin of the smooth umbilical wall. This ridge is apparently not developed at conch diameters exceeding 12–15 mm. Short, nearly imperceptible ribs occur across the umbilical shoulder of this same paratype but are not present in the ultimate volution of the larger holotype.

Figure 6,*B,C* portrays external sutures in which the width ratio V_1/L decreased from 0.45 at 7 mm conch diameter to 0.35 at maturity. The median saddle became progressively higher (in relation to lateral elements) and noticeably constricted as maturity was approached.

Discussion.—*Stenolobulites subglobosus* more closely resembles *S. admiralensis* (Plummer and Scott) than any other congener; however, at equivalent diameters, the whorl section of the former is less depressed than that of the latter, and the raised umbilical shoulders present on late volutions of *S. admiralensis* are not developed on proportionately late stages of *S. subglobosus*. General sutural design and conch ornament of the two species are similar. The absence of umbilical ribs at maturity distinguishes *S. subglobosus* from *S. stenolobulus* n. sp.,

Fig. 7. (Explanation on facing page.)

S. depressus n. sp., and *S. sinuosus* n. sp. *S. simulator* resembles *S. subglobosus* in development of a small umbilicus free of conspicuous nodes and in the narrowly rounded umbilical shoulder, but differs in possession of a finely strigate test traversed by more strongly developed biconvex growth striae and constrictions.

The mature suture of *S. subglobosus* (Fig. 6,*C*) resembles that of *S. admiralensis* (Fig. 6,*A*) in size and shape of the first lateral saddle and in the adorally expanded form of the lateral lobe; it differs in possession of a higher median saddle that is noticeably constricted at mid-height, prongs as well as lateral and umbilical lobes that are markedly attenuate, and a width ratio V_1/L of 0.35 as compared with 0.5 in *S. admiralensis*. The immature sutures of *S. subglobosus* are similar in general contours to those of *S. simulator* (see Fig. 9,*A–C*), but the ventral prongs are proportionately wider and more asymmetrical in *S. subglobosus*.

The specific name refers to the subglobose conch shape.

Occurrence.—All known representatives of *S. subglobosus* are from upper Wolfcampian strata (lower Sakmarian, Tastubian Substage) in West Texas. Holotype SUI 10704 and paratype USNM 424900 were secured from the upper part of the Lenox Hills Formation, 9 m (30 feet) below the base of the Skinner Ranch Formation on the steep S slope of Dugout Mountain, Brewster County, West Texas (Dugout Mountain Quadrangle, 1983). Silicified paratypes SUI 10703, 10706, 10707, 32731, 32738, 32739 are from the lower part of the Hueco Formation at the southern end of the Hueco Mountains, Hudspeth County (locality 202-a, Moyle, 1963). Paratypes SUI 2031 and 2032 were collected from equivalent strata in a small outlier at the southernmost Hueco Mountains, approximately 0.8 km (0.5 miles) S of the Pasotex pipeline road and 13 km (8 miles) SSE of Rancheria Peak, Hudspeth County. These two Hueco localities have not been verified in the field since publication of the Padre Canyon Quadrangle (1978).

Repository.—Holotype SUI 10702, paratypes SUI 2031, 2032, 10703, 10704, 10705 (2 specimens), 10706, 10707 (12 specimens), 32731, 32738, 32739, USNM 424900.

STENOLOBULITES DEPRESSUS
new species

Figures 2,*1a–g*; 7,*4*; 8,*A,B*; Table 1

Diagnosis.—A subglobose, widely umbilicate species of *Stenolobulites* (W/D, 0.7; U/D, 0.4) characterized by strongly depressed whorls (H/W, 0.4–0.45), and prominent umbilical ribs and constrictions that define an indistinct shallow sinus on a broad ventral salient.

Description.—Four relatively complete specimens and six fragments are included in *Stenolobulites depressus*. Holotype SUI 32674 is an incomplete but moderately well-preserved internal mold of 28 mm restored diameter that is septate except for a small portion of the ultimate volution. It has been extensively recrystallized but exhibits details of conch ornament and external suture. The ultimate and penultimate septa of the holotype are crowded, suggesting maturity. Paratypes 32675, 32701, and 32702 are well-preserved, relatively complete, internal molds of immature phragmocones. The six fragments (SUI 32703,

Fig. 7. Lower Permian *Stenolobulites,* and Upper Permian *Strigogoniatites* for comparison.——*1a–e. Stenolobulites sinuosus* n. sp.; *a,b,* holotype SUI 32705, Meade Peak Member of the Phosphoria Formation (Roadian), N side of US 89, 5.3 km E of Montpelier, Bear Lake County, SE Idaho, ×1; *c,* paratype SUI 32706, same horizon and locality as preceding (note mature modification of aperture), ×1; *d,e,* paratype SUI 32708, Meade Peak Member of the Phosphoria Formation, S wall of Raymond Canyon, W flank of Sublette Range, Lincoln County, southwestern Wyoming, ×2.——*2a,b. Stenolobulites subglobosus* n. sp., paratype USNM 424900, upper Lenox Hills Formation (lower Sakmarian), S of the top of Dugout Mountain, Brewster County, West Texas, ×2.5 (see also Fig. 3,*2a–e*).——*3a–g. Stenolobulites simulator* (Girty), Meade Peak Member of the Phosphoria Formation, S wall of Raymond Canyon, W flank of Sublette Range, Lincoln County, southwestern Wyoming; *a,* hypotype SUI 32733, ×3; *b,c,* hypotype SUI 32736 (note mature apertural modification), ×2; *d,e,* hypotype SUI 32719, ×2; *f,g,* hypotype SUI 32718, ×2 (see also Fig. 2,*3a,b*).——*4. Stenolobulites depressus* n. sp., paratype SUI 32702, Cathedral Mountain Formation (upper Artinskian), NW slope of Hill 4861, 4.8 km NW of Dugout Mountain, Catto-Gage Ranch, Brewster County, West Texas (vicinity USNM loc. 732u), ×2.5 (see also Fig. 2,*1a–g*).——*5a,b. Strigogoniatites kingi* Miller, hypotype SUI 32656, Zone of *Timorites* (bed 5 or 7 of the Difunta section), King loc. 20, Valle de Las Delicias, Coahuila, Mexico, ×1.

32704) are so incomplete that they add little morphologic data, but architectural peculiarities and general whorl outline relate them to the types. Conch diameters and proportions of selected specimens are listed in Table 1.

Subangular prorsiradiate ribs trend across the umbilical shoulder in all visible ontogenetic stages, and they constitute the most conspicuous feature of conch ornament. Approximately 22 ribs are developed on the ultimate volution of the holotype and smaller paratypes (SUI 32675, 32701). Fine, closely spaced, longitudinal strigae occur over the entire conch surface, except on the inner two-thirds of the umbilical wall; approximately 50 are present between umbilical shoulders of the holotype at a conch diameter of 23 mm. Constrictions (four per volution) and fine growth lamellae that cross the strigae outline a faint sinus on the crest of the salient at diameters exceeding 10 mm; no such deflection appears at smaller diameters.

Sutures of the holotype and one paratype (Fig. 8) reveal ratios of sutural elements V_1/L that approximate 0.5 at maturity (D exceeding 25 mm) but may approach 0.6 in immature stages.

Discussion.—*Stenolobulites depressus* is recognizable through the unique combination of subglobose conch shape, strongly depressed whorls, large umbilicus (Table 1), and conspicuous umbilical ribs. This species resembles the type species only in development of pronounced umbilical ribs and a faint ventral sinus; *S. stenolobulus* n. sp. developed a subdiscoidal conch, proportionately less depressed whorls, and a moderately large umbilicus. *S. sinuosus* n. sp. has similar umbilical ribs, but the small umbilicus, subdiscoidal shape, equidimensional whorls, and sinuous constrictions set this species apart from *S. depressus*.

Sutures of *S. depressus* (Fig. 8) are similar in general proportions to those of both the type species and *S. admiralensis* but differ in moderate attenuation of the ventral prongs, first lateral lobe, and umbilical lobe. Also, the first lateral lobe in *S. depressus* is strongly expanded adorally, with divergent flanks, whereas in *S. stenolobulus* n. sp. this element is parallel-sided at maturity. The width ratio V_1/L is proportionately much less in *S. simulator* and *S. subglobosus* (V_1/L, 0.3–0.35) than in *S. depressus*.

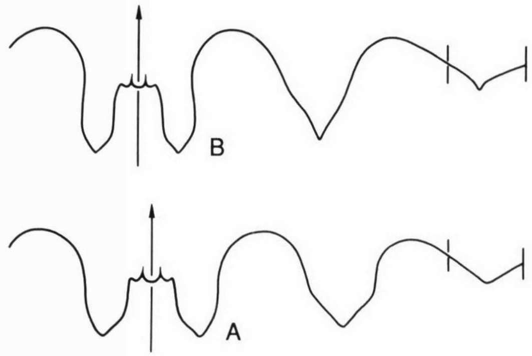

Fig. 8. Diagrammatic representation of external sutures of *Stenolobulites depressus* n. sp., Cathedral Mountain Formation (upper Artinskian), NW slope of Hill 4861, 4.8 km NW of Dugout Mountain, Catto-Gage Ranch, Monument Springs Quadrangle, Brewster County, West Texas (vicinity of USNM loc. 732u); *A,* paratype SUI 32675, D 14 mm, H 5 mm, W 10 mm; *B,* holotype SUI 32674, D approximately 25 mm, H 8 mm, W 20 mm.

The specific name refers to the strongly depressed whorls.

Occurrence.—*Stenolobulites depressus* is known only from the Cathedral Mountain Formation (Baigendzhinian) of West Texas. The holotype, paratypes SUI 32675, 32701, 32702 and topotypes SUI 32703, 32704 were collected along the N and W slopes of an isolated hill previously identified as Hill 4861, about 4.8 km (3 miles) NW of Dugout Mountain, Catto-Gage Ranch, Brewster County, West Texas (Dugout Mountain Quadrangle; 30°14.2'N, 103°26.9'W). Paratype USNM 424899 was secured about 3.2 km (2 miles) W of the base of the SW side of Iron Mountain, Glass Mountains, Brewster County. This locality falls near USNM locality 723y, just E of the road intersection with elevation 4629 feet (Gilliland Peak Quadrangle, 1983).

Repository.—Holotype SUI 32674, paratypes SUI 32675, 32701, 32702, topotypes 32703, 32704; paratype USNM 424899.

STENOLOBULITES SIMULATOR (Girty, 1910)

Figures 2,*3a,b*; 7,*3a–g*; 9; Table 1

Gastrioceras simulator Girty, 1910:52–54, pl. 7, figs. 11–13. Miller and Cline, 1934:297–298, pl. 39, figs. 11–14. Ruzhentsev, 1936: 1081.

Gastrioceras stenolobatum Miller and Cline, 1934: 298–299, pl. 39, figs. 1–4. Ruzhentsev, 1936:1081.
Pseudogastrioceras simulator stenolobatum (Miller and Cline). Miller and Furnish, 1940:85, pl. 20, figs. 6,7, text-fig. 23A.
Pseudogastrioceras simulator (Girty). Miller and Unklesbay, 1943:16, pl. 3, fig. 1, text-fig. 6D. Glenister and Furnish, 1961:718. Ruzhentsev, 1961:58. Nassichuk, Furnish, and Glenister, 1965:23.
Altudoceras simulator (Girty). Ruzhentsev, 1951: 141.
Altudoceras stenolobatum (Girty). Ruzhentsev, 1951:141.
?*Pseudogastrioceras* spp. [Part] Miller, Furnish, and Clark, 1957:1063–1064, pl. 134, fig. 10,?11 [*non* figs. 8,9,?12, *Stenolobulites sinuosus*].

Diagnosis.—A thickly subdiscoidal, finely strigate species of *Stenolobulites* (W/D, 0.55–0.6) characterized by development of a moderately small umbilicus (U/D, 0.25) and sutures in which the first lateral lobe is nearly three times the width of the corresponding ventral prongs. Elements V_1 and L characteristically exhibit uniformly rounded, nonattenuate bases.

Description.—Approximately 400 complete or fragmental topotypes of *Stenolobulites simulator,* most secured by Miller and Cline from the Phosphoria Formation of southwestern Wyoming, are at the authors' disposal. Internal and external molds are represented equally; all are small, and most are juveniles. From this numerically significant collection, we have selected about 50 specimens to compare and supplement existing descriptions. The diameter of the largest representative (hypotype SUI 711) is approximately 22 mm, and, although the anterior part of the body chamber is not preserved, the specimen is probably mature. Hypotype SUI 32736 is mature at a diameter of 18 mm. Conch diameters and proportions are listed in Table 1.

Numerous fine longitudinal strigae occur over the entire external surface of the conch, except for the inner two-thirds of the umbilical wall. There are fewer than 50 at conch diameters less than 10 mm, but as many as 65 occur at 20 to 25 mm diameter (Fig. 7,*3c,e–g*). Delicate growth striae and constrictions outline a prominent ventral sinus flanked by narrowly rounded ventrolateral salients (Fig. 7,*3b,e,f*). Growth striae are relatively conspicuous in the inner few volutions, where longitudinal strigae are not well developed. Similarly, the constrictions are best developed on inner volutions and become progressively less discernible at larger sizes, up to but not including the one-quarter volution preceding maturity. Three or four constrictions per volution are fairly uniformly spaced at diameters less than 10 mm, but spacing becomes closer and less regular at larger diameters. Faint ribs are present across broadly rounded umbilical shoulders of inner volutions less than 5 mm diameter, but umbilical shoulders of larger whorls are subangular and smooth.

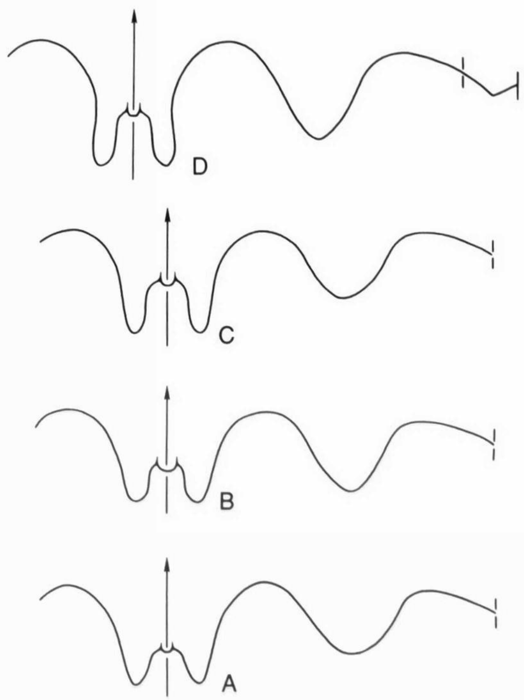

Fig. 9. Diagrammatic representation of external sutures of *Stenolobulites simulator* (Girty), Meade Peak Member of the Phosphoria Formation, S wall of Raymond Canyon, Sublette Range, Lincoln County, SW Wyoming; *A,* hypotype SUI 32719, D 9 mm, H 4.5 mm, W 6 mm; *B,* hypotype SUI 32717, D 8 mm, H 4 mm, W 6 mm; *C,* hypotype SUI 32718, D 8 mm, H 4 mm, W 5.5 mm; *D,* hypotype SUI 711, D 15 mm, H 6 mm, W 8 mm.

Hypotype SUI 32736 exhibits mature modifications (Fig. 7,*3b,c*), including gradual thickening of the shell in the ultimate one-quarter volution that culminates in a deep constriction on the internal mold apicad of an angular flare in the terminal peristome. Depth of the hyponomic sinus more than doubled in this development, to 2 mm. Presumed crowding of the ultimate septa cannot be verified for this specimen, as the body chamber slightly exceeds a full volution in length.

Figure 9 portrays wide variation in the relative size and shape of the ventral prongs of *Stenolobulites simulator,* some representatives exhibiting strongly divergent flanks of the element, whereas others display virtually parallel sides; intermediate forms connect these two extremes. The general pattern of sutural ontogeny, however, is toward parallel-sided ventral prongs accompanied by a decrease in the width ratio V_1/L.

Discussion.—From the examination of Girty's three figured cotypes of *Gastrioceras simulator* and twenty-two previously undescribed topotypes, Miller and Cline (1934) concluded that one of Girty's figured specimens (Girty, 1910, pl. 7, fig. 13,13a) and five of the new topotypes differ from typical *G. simulator* sufficiently to warrant recognition of a new species. They proposed *G. stenolobatum* to include those forms that resemble *G. simulator* in conch shape and ornament but reputedly differ in possession of extremely narrow prongs of the ventral lobe. Our subsequent preparation of virtually all 400 specimens secured by Miller and Cline revealed intermediates in relative width of sutural element V_1 between types of the two proposed taxa. Consequently, the two are considered conspecific.

Compressed external casts figured by Miller, Furnish, and Clark (1957, pl. 134, fig. 11) as *Pseudogastrioceras* spp. are available for study. They are referable to *Stenolobulites*; although sutures are not visible, the form of the constrictions and details of shell sculpture suggest affinity with *S. simulator.*

Assignment of the present species to *Stenolobulites* is suggested by outline and proportions of sutural elements V_1 and L. No described species of *Pseudogastrioceras,* including juvenile stages, is known to possess the distinctive sutural configuration or the extremely small width ratio V_1/L displayed by *S. simulator,* although some other pseudogastrioceratins possess similar conch proportions. The virtually identical shape, shell sculpture, and sutural configuration of the juvenile stages of both *S. simulator* and the sympatric *S. sinuosus* n. sp. suggest close phyletic relationship. At maturity, however, representatives of *S. simulator* can be differentiated from *S. sinuosus* in posssession of proportionately depressed whorls and thicker conch (Table 1) and in the absence of umbilical ribs. *S. admiralensis* and *S. subglobosus* n. sp. differ from *S. simulator* in their comparatively coarser longitudinal sculpture and thicker conch. *S. depressus* n. sp., *S. stenolobulus* n. sp., and *Stenolobulites* n. sp. (herein) can be distinguished from *S. simulator* by their conspicuous umbilical ribs and proportionately wider umbilicus.

Occurrence.—Girty's specimens are from the Meade Peak Member of the Phosphoria Formation (Roadian) in Raymond, Coal, and Layland Tunnel canyons along the W flank of the Sublette Range, Lincoln County, southwestern Wyoming; rare additional specimens of *S. simulator* were collected by Miller and Cline from the same horizon in Raymond Canyon.

Repository.—Holotype USNM 1722; paratype 1724; hypotypes SUI 32714–32719, 32721, 32722, 32724, 32725 (2 specimens), 32733-32736; topotypes SUI 32720 (8 specimens), 32723, 32726 (10 specimens), 32727 (bulk), 708 (16 specimens), 711, 712 (3 specimens).

STENOLOBULITES SINUOSUS new species

Figures 7,*1a–e*; 10; Table 1

Gastrioceras brevicostatum [Part] Miller and Cline, 1934:299, 3 unfigured paratypes SUI 710 only [*non* holotype SUI 709 *Daubichites*].

Pseudogastrioceras spp. [Part] Miller, Furnish, and Clark, 1957:1063–1064, pl. 134, figs. 8,9,?12 [*non* figs. 10,?11 *Stenolobulites simulator*].

Diagnosis.—A subdiscoidal, narrowly umbilicate species of *Stenolobulites* (W/D, 0.5; U/D, 0.25–0.3) characterized by a deep, narrow hyponomic sinus at diameters greater than 20 mm.

Description.—Approximately 20 relatively complete specimens and 10 fragments are assigned to *Stenolobulites sinuosus.* Holotype SUI 32705 (Fig. 7,*1a,b*), the largest complete specimen, has a diameter of 50 mm and comprises a well-preserved internal mold of the phragmocone, together with the apical two-thirds of the body chamber. Approximation of the last

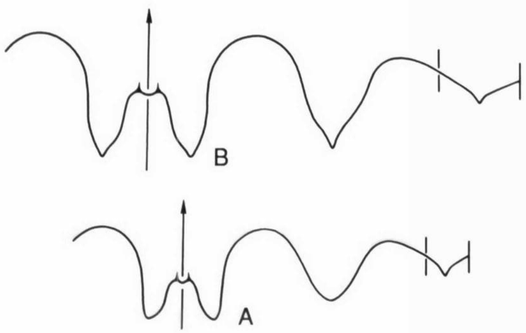

Fig. 10. Diagrammatic representation of external sutures of *Stenolobulites sinuosus* n. sp, Meade Peak Member of the Phosphoria Formation (Roadian), spoil heap, S side of US89, 5.3 km E of Montpelier, Bear Lake County, SE Idaho (Sec 31, T 12 S, R 45 E, Montpelier Quadrangle); *A*, paratype SUI 32708, D 10 mm, H 4 mm, W 6 mm; *B*, holotype SUI 32705, D 32 mm, H 12 mm, W 14.5 mm.

two sutures is interpreted as indicating maturity at a phragmocone diameter of approximately 35 mm. The similarly sized phragmocone of paratype SUI 32706 retains at least a full volution of crushed body chamber that terminates at a diameter approaching 80 mm in a spectacular modification of the mature peristome (Fig. 7,*1c*). Diameters and conch proportions are listed in Table 1.

Conspicuous longitudinal strigae cover the entire external surface, except for the smooth inner three-fourths of the umbilical wall. Approximately 50 such strigae occur at conch diameters of 20 mm, and the number may decrease slightly after 50 mm diameter. Interstrigal furrows are about four times as wide as the intervening ridges at 45 mm diameter; they generally increase in width toward the umbilical shoulder. Growth striae and constrictions define a deep, broadly rounded, hyponomic sinus flanked by high, rounded, ventrolateral salients; five constrictions are present on the ultimate whorl of the holotype. Sinuosity of the aperture was accentuated with approach to maturity, and the terminal hyponomic sinus of paratype SUI 32706 (Fig. 7,*1c*) is 20 mm long and 10 mm wide. Well-developed prorsiradiate ribs extend from the outer margin of the umbilical wall across the dorsolateral half of the flanks; approximately 30 occur in the ultimate whorl of the holotype.

External sutures illustrated in Figure 10 portray increase in the width ratio V_1/L from 0.4 in early growth stages (15 mm diameter) to 0.6 at maturity.

Discussion.—Although some congeners resemble *Stenolobulites sinuosus* in general conch shape and in certain features of the ornament, none has growth striae and constrictions that are as strongly biconvex. Further, *S. subglobosus* n. sp. and *S. simulator* lack the umbilical ribs of *S. sinuosus*. *S. admiralensis* is more globose and has coarser longitudinal sculpture. *S. sinuosus* differs from *S. stenolobulus* n. sp. and *S. depressus* n. sp. in possession of a proportionately smaller umbilicus (Table 1).

The mature suture of *Stenolobulites sinuosus* most nearly resembles that of *S. depressus* n. sp., but differs in possession of a significantly greater width ratio V_1/L. Close similarities in the immature sutures of *S. sinuosus* and the sympatric *S. simulator* suggest the close phylogenetic relationship discussed under the latter species.

Large size, subdiscoidal conch shape, longitudinal strigae, and sutural contours of *Stenolobulites sinuosus* may suggest affinities with species of *Pseudogastrioceras*. The subparallel flanks of the ventral lobe and the larger umbilicus (U/D, 0.25–0.3 *vs.* 0.1–0.2 in *Pseudogastrioceras*), however, necessitate assignment of the species to *Stenolobulites*. The specific name refers to the strongly biconvex growth lamellae and constrictions.

Occurrence.—The holotype and paratypes SUI 32706, 32707, and 32710 are from black limestone concretions in the shales of the phosphatic Meade Peak Member of the Phosphoria Formation (Roadian), along the N side of US Highway 89, 5.3 km (3.3 miles) E of Montpelier, Montpelier Quadrangle, Bear Lake County, southeastern Idaho. Paratypes SUI 710, 5989, 32708, 32709, and 32711 to 32713 are from the Meade Peak Member exposed along the S side of Raymond Canyon, W flank of the Sublette Range, Lincoln County, southwestern Wyoming. Two slabs (SUI 5988, 32732), with thinly compressed specimens referred with question to *Stenolobulites sinuosus,* were collected by D. L. Clark and Walter L. Youngquist from the Phosphoria correlative Park City Formation along the Right Fork of Hobble Creek Canyon, Wasatch Mountains, SE of Provo, Utah (Miller, Furnish, and Clark, 1957, p. 1064).

Repository.—Holotype SUI 32705, paratypes SUI 710A-C, 5989, 32706 to 32711, 32712A,B, and 32713 (15 specimens).

STENOLOBULITES new species

Figures 3,*1a-c*; Table 1

Description.—Two poorly preserved septate internal molds represent an unnamed species of *Stenolobulites.* Details of the suture line and ornament have been obscured by silicification, but similarity of conch proportions and visible ornament suggest that they are conspecific. The smaller specimen (SUI 32737, Fig. 3,*1b,c*), from West Texas, exhibits an open umbilicus, and seven volutions are visible down to the exposed protoconch. The larger individual (Western Reserve Univ. G-67-1, Fig. 3,*1a*), from Guatemala, is less well preserved; five outer whorls are visible, but the inner volutions are indistinct. Diameters and conch proportions are included in Table 1.

Approximately 24 pronounced umbilical ribs occur on the outer volution of both individuals, but longitudinal sculpture is not recognizable. Each specimen displays a single constriction that forms a low transverse salient across the venter of the ultimate whorl. Realistic evaluation of the sutures is precluded by poor preservation and small size, but a basic eight-lobed form is apparent, and the prongs of the ventral lobe are narrower than the first lateral lobe.

Discussion.—The combination of widely umbilicate, discoidal conch and umbilical ribs in *Stenolobulites* n. sp. does not occur in any known congener. Closest similarity is to the type species and to *S. depressus* n. sp., all three species developing distinct umbilical ribs and depressed whorls. *S. stenolobulus* n. sp., however, possesses a proportionately smaller umbilicus and whorls that are less depressed than in *Stenolobulites* n. sp. *S. depressus* n. sp. differs from *Stenolobulites* n. sp. by its slightly smaller umbilicus, markedly depressed whorls, and subglobose shape.

Further evaluation of this species must await discovery of well-preserved specimens.

Occurrence.—Both specimens of *Stenolobulites* n. sp. were collected from strata in direct association with ammonoids of Artinskian age. The larger individual was secured by F. G. Stehli from the Chocal Formation in western Guatemala, near the border of the state of Chiapas, Mexico (Stehli locality G-67-1). The remaining specimen is from USNM locality 707b (Cooper and Grant, 1972), near the top of the Sullivan Peak Member of the Skinner Ranch Formation, E side of Lenox Hills, Altuda Quadrangle, Glass Mountains, West Texas.

Repository.—G-67-1, Department of Geology, Western Reserve University; SUI 32737, The University of Iowa.

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