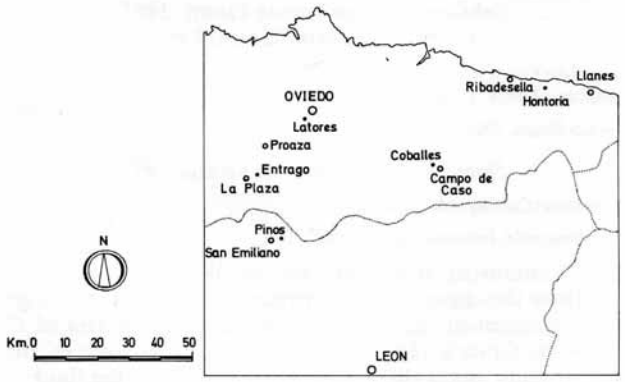
NEW CARBONIFEROUS STENOSCISMATACEAN BRACHIOPODS FROM OVIEDO AND LEON, SPAIN

by M. L. MARTINEZ-CHACON

ABSTRACT. Four new species of Stenoscismatacea, *Camerisma* (*Callaiapsida*) *alcaldei*, *C.* (*Callaiapsida*) *paucicostata*, *Cyrolexis granti*, and *Stenoscisma winkleri* are described from the Cantabrian Mountains. The two species of *Callaiapsida*, from the lower and upper Bashkirian, are the oldest attributed to the subgenus, and they show transitional characters between *C.* (*Camerisma*) and typical *C.* (*Callaiapsida*); moreover, the distribution of the subgenus is now extended from the Arctic. *Cyrolexis granti* from the Kashirian is also the oldest species of the genus, previously known only from the Permian.

THE Carboniferous Rhynchonellida from the Cantabrian Mountains are little known; they are infrequently cited and only two authors, Mallada (1875) and Delépine (1943), have described Carboniferous species belonging to the order. Moreover, the majority of these citations and descriptions refer to the Rhynchonellacea and until now only two forms of the superfamily Stenoscismatacea are known in the region: *Camarophoria crumena* (Martin) described by Mallada (1875) from different points in Palencia and *Coledium* sp. quoted by Wagner (1971*b*, Winkler Prins's determination) also from Palencia province. The present paper constitutes a first attempt to attain a regional knowledge of the representatives of this interesting group. Four new species are described, belonging to *Camerisma*, *Cyrolexis*, and *Stenoscisma*. They come from Oviedo and Leon, provinces very different from Palencia, despite all three being in the Cantabrian Mountains. Text-fig. 1 shows



TEXT-FIG. 1. Map showing the situation of the fossiliferous localities. .... provincial boundary.

[Palaeontology, Vol. 20, Part 1, 1977, pp. 209–223, pls. 29–30.]

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U. S. S. R.		W. EUROPE		Entrago – Pinos area	Latores area	C.de Caso–Caballes area	Hontoria area
MOSCOVIAN	PODOLSKIAN	WESTPHALIAN	C			Escalada Fm.	Escalada Fm.
	KASHIRIAN		B			Beleño Fm.	Shales and sandstones
	VEREYAN		A	San Emiliano Fm.			
BASHKIRIAN	UPPER						
	MIDDLE						
	LOWER	NAMURIAN	C	Valdeteja Fm.	Valdeteja Fm.	Valdeteja Fm.	
NAMURIAN							

TEXT-FIG. 2. Chart of the Carboniferous formations in the area, showing correlation with the Western European and Russian standard sections.

the situation of the fossiliferous localities and text-fig. 2 shows the litostratigraphical units in the area and their age. All the specimens are housed in the Departamento de Paleontología de la Universidad de Oviedo.

SYSTEMATIC DESCRIPTIONS

Superfamily STENOSCISMATACEA Oehlert, 1887
Family ATRIBONIIDAE Grant, 1965
Subfamily ATRIBONIINAE Grant, 1965
Genus CAMERISMA Grant, 1965

1965*a* *Camerisma* Grant, p. 63.
1971 *Camerisma* Grant; Grant, p. 323.

Type species. *C. prava* Grant, 1965.

Subgenus CALLAIAPSIDA Grant, 1971

1971 *Camerisma* (*Callaiapsida*) Grant, p. 323.

Type species. *C.* (*Callaiapsida*) *kekuensis* Grant, 1971.

Discussion. The Cantabrian specimens are smaller-sized than typical *C.* (*Callaiapsida*); they show the characteristic peripheral grooves of the subgenus but with a much smaller development than those of the type species and of *C.* (*C.*) *arctica* (Holtedahl, 1924) in Grant's (1971) figures; in addition, one of the forms here assigned to the subgenus bears ribs on the anterior part of the flanks. The internal characters coincide with those of *Callaiapsida* since the space between the camarophorium and the hinge plate is filled by secondary shell covering the intercamarophorial plate. On the basis of the peripheral grooves and internal characters these

species of *Camerisma* are assigned to the subgenus *Callaiapsida*, in spite of the short development of the grooves and small size of both forms, and the ribbed flanks of one of them. *Camerisma* (*Callaiapsida*) has been recorded from Podolskian and Permian rocks. The species here described, of lower and upper Bashkirian age, are the oldest yet recorded. It could be supposed that *C.* (*Callaiapsida*) would evolve in time from *C.* (*Camerisma*), with larger size and greater development of peripheral grooves; perhaps the Cantabrian species are the link between both subgenera. On the other hand, Grant (1971) suggests that *C.* (*Callaiapsida*) is exclusively Arctic in its distribution; this may be correct for the Permian, but during the Carboniferous the subgenus was more widely distributed, since it is unlikely that Northern Spain was at such high latitudes in the Carboniferous.

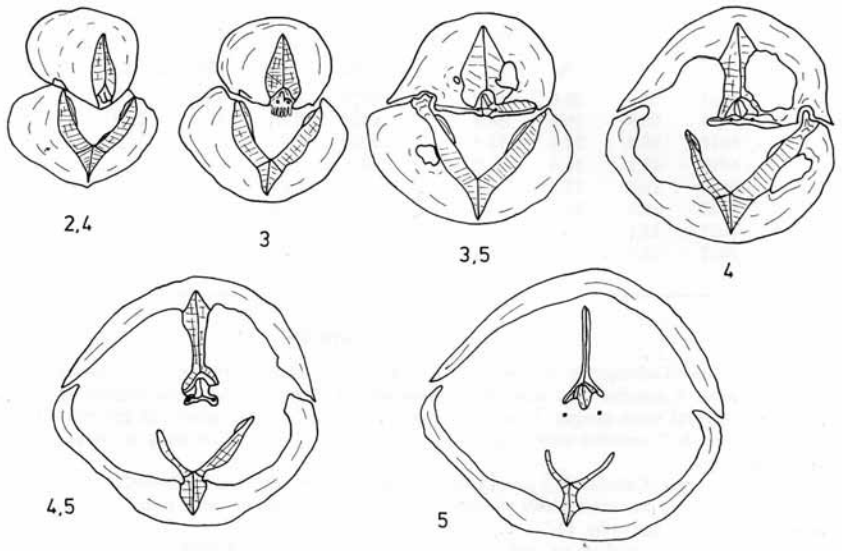
Camerisma (*Callaiapsida*) *alcaldei* sp. nov.

Plate 29, figs. 1–7; text-fig. 3

Derivation of name. Dedicated to Dr. J. L. García-Alcalde.

Material. Holotype (DPO 6915, Pl. 29, figs. 1–5), 13 paratypes (DPO 6916–6928) and other 42 specimens (DPO 6929–6970) from the type locality and 11 specimens (DPO 6971–6981) from Entrago (Oviedo).

Type horizon. A light grey limestone, containing many brachiopods, crinoids, bryozoans, and molluscs, from the upper part of the Valdeteja Formation, of Lower Bashkirian age, from Latores village (6 km SW. of Oviedo), at the top of a small hill, 222 m high, near the km 7 of the Vasco-Asturiano railroad. Latitude 43° 19′ 55″, longitude 2° 12′ 15″.



TEXT-FIG. 3. *Camerisma* (*Callaiapsida*) *alcaldei* sp. nov. Transverse sections of specimen DPO 6928 showing internal structures of both valves, especially the development of spondylium and camarophorium. Distances from the ventral beak in mm, ×4.

Diagnosis. Species small for the subgenus, with very high and keel-shaped dorsal median fold, incipient peripheral grooves and smooth flanks.

Description. Small shell of trigonal outline and keel-shaped profile; slightly transverse (L/W average of 0,84), although elongated in young stages; with anteriorly spreading flanks; rather thick (L/T average of 1,31); dorsibiconvex; anterior commissure strongly uniplicate with inverted V-shape; shell frequently somewhat asymmetrical. Ventral valve gently convex. Beak pointed and strongly curved over dorsal umbo, without pedicle foramen. Sulcus beginning near middle of valve as a shallow and wide depression with rounded floor, widening and deepening rapidly toward the front, where it strongly curves dorsally to join the opposite fold through a high tongue; sulcus with median groove becoming stronger anteriorly. Ventral flanges appear anterior to articulation zone, overlapped by dorsal ones and giving way anteriorly to narrow and shallow peripheral grooves, covered by a very thin extension of valve edge (see Pl. 29, figs. 4, 6, 7). Dorsal valve strongly convex, with a beak pointed, directed towards ventral valve and covered by it; umbonal region very convex and high. A sharp and keel-shaped fold starts in posterior half of valve; separated from flanks by two more or less pronounced grooves ending at boundary between anterior and lateral commissures; flanks descending also abruptly (although to smaller degree than fold) from such grooves to the commissure. Dorsal flanges overlapping ventral ones all around commissure, with greatest overlap in posterior part.

Ornament only of growth lines, more visible on ventral valve, especially on the ventral flanks.

Dimensions of some specimens in mm

DPO	L	W	T	DPO	L	W	T
6915	15	20,8	14,8	6923	16,3	17,5	12,6
6916	15,8	19,3	14,4	6924	15,4	19,1	13,3
6917	15,4	20,5	12,5	6925	19	20,5	11,7
6918	13,1	15,6	10,5	6926	9,9	9,2	5
6919	15,9	17,1	9,6	6927	14,6	15,6	9,3
6920	16,6	19,5	14,8	6971	12,4	18,2	11,2
6921	13,1	15	10	6972	13,9	18	13,6
6922	12,1	14,5	8,8				

EXPLANATION OF PLATE 29

Figs. 1–7. *Camerisma* (*Callaiapsida*) *alcaldei* sp. nov., ×2. 1–5, holotype, DPO 6915. 1–3, dorsal, ventral, and lateral views. 4, anterior view showing incipient peripheral groove on tongue covered by very thin extension of ventral valve margin. 5, posterior view showing peripheral groove on the left lower side and spondylium. 6, 7, anterior view of paratypes, DPO 6916, 6917, both showing incipient peripheral grooves on tongue.

Figs. 8–12. *Camerisma* (*Callaiapsida*) *paucicostata* sp. nov., ×2. Holotype, DPO 6982, dorsal, ventral, lateral, anterior, and posterior views showing pronounced asymmetry; note poorly developed peripheral groove on tongue in fig. 11.

Figs. 13, 14. *Stenoscisma winkleri* sp. nov., ×3. DPO 7273, 7272, posterior view of two internal moulds of both valves showing spondylium and camarophorium.

Fig. 15. *Cyrolexis granti* sp. nov., ×4. Holotype, DPO 7283, posterior view of a specimen with valves partially destroyed, showing part of spondylium and camarophorium.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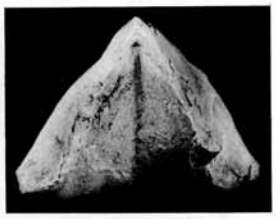
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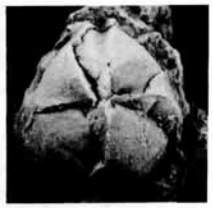
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MARTINEZ-CHACON, Spanish Carboniferous Stenoscismatacea

Ventral interior posteriorly very thickened, spondylium large (see text-fig. 3), with thick walls, supported by low and broad median septum duplex, buried by secondary shell in posterior part (and further forward) so as to appear sessile in its beginning; septum continuing slightly forward of the spondylium. Teeth strong, short, rounded, and each one presenting a lateral exterior crenulation. Dorsal interior also posteriorly thickened. Camarophorium with high and slender median septum duplex, supporting narrow trough with semicircular transverse section. Thick and duplex intercamarophorial plate buried posteriorly in secondary shell, free anteriorly when it ceases to support the hinge plate. Short hinge plate finishing behind camarophorium; inner hinge plates extending more anteriorly than outer hinge plates. Big, rounded cardinal process, with myophore of high lamellae. Crura diverging from hinge plate anteroventrally. One specimen, with part of its anterior flank decorticated, shows deep pallial impressions which branch dichotomously, especially close to the anterior margin.

Discussion. *C.* (*C.*) *alcaldei* is distinguished from typical *Callaiapsida* by its smaller size and poorly developed peripheral grooves. Its general form looks like *Camerisma* (*Camerisma*) *sella* (Kutorga, 1844) and *C.* (*Callaiapsida*) *paucicostata* sp. nov., but the difference between them is the presence of a higher and narrower fold and the absence of ribs on the flanks in the former.

Camerisma (*Callaiapsida*) *paucicostata* sp. nov.

Plate 29, figs. 8–12; text-figs. 4, 5

Material. Holotype (DPO 6982, Pl. 29, figs. 8–12), 6 paratypes (DPO 6983–6988) and 12 other specimens (DPO 6989–7000) from the type locality (locality 30 of Winkler Prins, 1968) and 2 other specimens (DPO 7001, 7002) from a nearby locality (locality 29 of Winkler Prins, 1968).

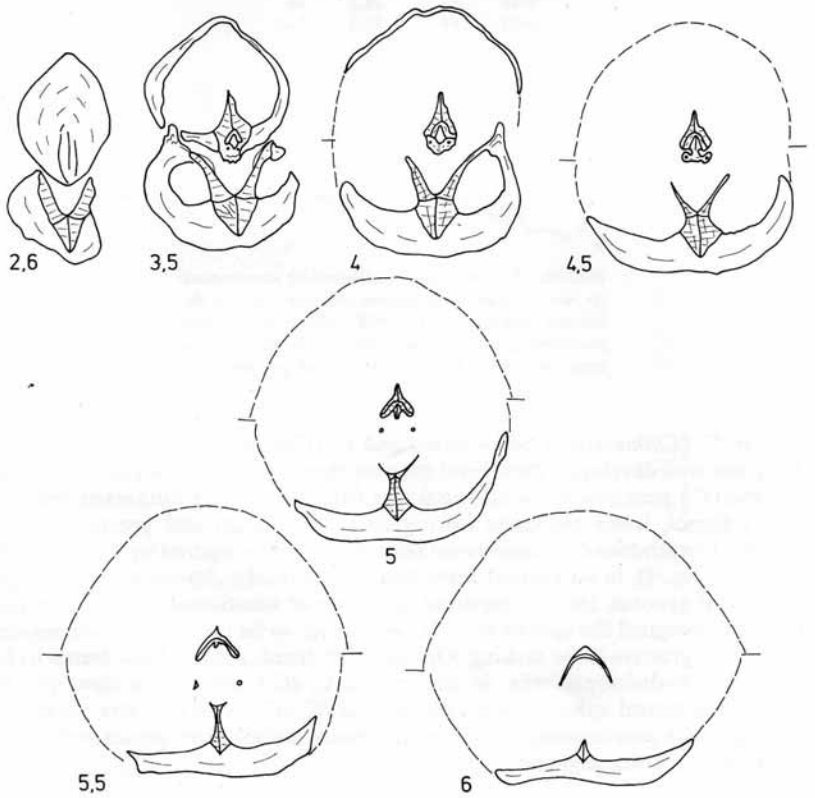
Type horizon. A limestone in the upper part of the San Emiliano Formation, Upper Bashkirian age, north-east of Pinos village (León), slope of the mount on the left from Pinos following the Alcantarilla stream. Latitude 42° 59′ 11″, longitude 2° 16′ 56″.

Diagnosis. Small for the subgenus, with high and keel-shaped fold, flanks ornamented by one to three ribs, peripheral grooves with slight development and rather pronounced asymmetry.

Description. Small shell of trigonal outline and keel-shaped profile, transverse (L/W approximately 0,75), rather thick (L/T approximately 1,15), with anteriorly spreading flanks; dorsibiconvex; anterior commissure strongly uniplicate and inverted V-shaped; pronounced asymmetry. Ventral valve gently convex. Beak pointed and strongly incurved over dorsal umbo, without pedicle opening. Sulcus beginning near posterior third of valve as gentle and rounded depression deepening anteriorly, where it curves dorsally into the high V-shaped tongue; median groove running along floor and commonly asymmetrical anteriorly; sulcus separated from each flank by one rib. Flank towards which median groove slopes is less well developed. Ventral flanges posteriorly overlapped by dorsal ones, anteriorly giving rise to shallower peripheral grooves, which are covered by a laminar expansion of valve edge (see text-fig. 5 and Pl. 29, fig. 11). Dorsal valve very convex in transverse section. Beak ventrally directed, sinking in other valve and covered by opposite beak. Umbo very

convex and high. Median fold starting in posterior third of valve, keel-shaped, posteriorly narrow but widening anteriorly, bordered by grooves separating it from steep flanks. As in the ventral valve, one flank, commonly better developed. Dorsal flanges with greatest overlap posteriorly. Flanks ornamented by one to three strong, angular ribs on each one, those bordering the fold and sulcus developed first, the lateral ribs only formed near the anterior margins. Ribs more prominent on ventral valves and more numerous on the larger side of shells. Growth lines faint except on the tongue where they may be almost rugose.

Ventral interior with spondylium supported by low and thick median septum duplex (see text-fig. 4), buried by secondary shell posteriorly so as to appear sessile; when septum is conspicuous, its base is very thickened, thickness decreasing anteriorly and dorsally; spondylium rather narrow ventrally, widening dorsally. Teeth

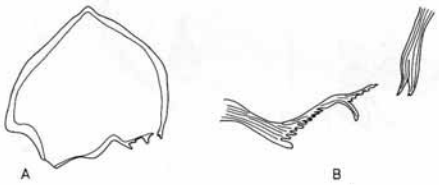


TEXT-FIG. 4. *Camerisma* (*Callaiapsida*) *paucicostata* sp. nov. Transverse sections of specimen DPO 6988 showing internal structures. Distances from the ventral beak in mm, ×4.

are short, rounded, and weak. Dorsal interior posteriorly thickened to bury the high but short median septum duplex supporting a short narrow trough of the camarophorium. Intercamarophorial plate buried posteriorly. Hinge plate with very wide and short outer hinge plates and very narrow and rather long inner ones, which cover the camarophorium only posteriorly. Cardinal process large and rounded, with its myophore of short lamellae. Crura project forward from the hinge plate ventrolaterally.

Dimensions of some specimens in mm

DPO	L	W	T
6982	15,3	19	13,2
6984	14,1	19,2	—
6985	16	21,7	14
6986	—	21,2	16
6987	17	21,8	14,6



TEXT-FIG. 5. *Camerisma* (*Callaiapsida*) *paucicostata* sp. nov. A, transverse section near the front of deformed specimen DPO 6983 showing incipient peripheral groove on the right, ×3. B, detail of the same section, with poorly developed groove, ×13.

Discussion. *C.* (*Callaiapsida*) *paucicostata* and *C.* (*Callaiapsida*) *alcaldei* are smaller and have less well developed peripheral grooves than the type species of *Callaiapsida*. *Camerisma* (*C.*) *paucicostata* is distinguished from the other Cantabrian species by its ribbed flanks, lesser thickness (owing to a lower fold) and greater degree of asymmetry. It resembles *C.* (*Camerisma*) *sella* (Kutorga), as figured by Tschernyschew (1902, pl. 23, fig. 4), in its general form and ribbed flanks; however, on the figures the peripheral grooves are not apparent and are not mentioned in the description. Grant (1971) assigned the species to *C.* (*Camerisma*), so he too must have considered the peripheral grooves to be lacking. On the other hand, *paucicostata* seems to have more and better-developed ribs, in contrast to *C.* (*C.*) *sella* where they are more evident on the dorsal valve than on the ventral. *C.* (*C.*) *sella* is a little larger than *C.* (*Callaiapsida*) *paucicostata*, with the maximum width more posteriorly located and it presents a lower asymmetry level.

Subfamily PSILOCAMARINAE Grant, 1965
Genus CYROLEXIS Grant, 1965

1965*a* *Cyrolexis* Grant, p. 88.

Type species. Cyrolexis haquei Grant, 1965.

Cyrolexis granti sp. nov.

Plate 29, fig. 15; Plate 30, figs. 23–26

Derivation of name. Dedicated to Dr. R. E. Grant.

Material. Holotype (DPO 7283, Pl. 29, fig. 15), specimen with the two valves partially destroyed showing part of the internal structures, and twenty paratypes (DPO 7284–7302, 8522) from the type locality and six specimens (DPO 7303–7307) from three nearby localities. All the specimens are preserved as moulds or casts, except for the holotype in which some shell remains.

Type locality. Basal part of a blackish shale, thickness of 25–30 m, in the upper part of the Beleño Formation, about 80 m below the Escalada Formation (Lower Moscovian, probably Kashirian, according to Winkler Prins, 1968), between Campo de Caso and Coballes (Oviedo), on the right of the road from Riaño to Oviedo, coming from km 53 to 54. Longitude 1° 39′ 50″, latitude 43° 10′ 47″.

Diagnosis. Small, globose and transverse shell with a fold weakly differentiated from the flanks, and beginning in posterior half of valve; bearing two strong ribs. Sulcus shallower than fold, beginning generally anteriorly to it and having a median rib, flanks smooth or with a rib. Interior with no intercamarophorial plate or developed only as a low elevation on the posterior floor of the camarophorium; hinge plate supported by sides of posterior part of camarophorium.

Description. Small (length between 5 and 7 mm), transverse (width between 7 and 9 mm), globose and dorsibiconvex shell. Anterior commissure sulciplicate. Ventral valve with greatest convexity in umbonal region; beak short and slightly incurved over dorsal one. Sulcus shallow, with rounded floor and greatly widening anteriorly; at about 3 mm or more forward from the umbo a wide but low and rounded rib developed. In some specimens a pair of ribs separate the sulcus from the flanks. Posteriorly flat flanges are overlapped by those of the dorsal valve. Dorsal valve more strongly convex; beak short, ventrally directed and covered by that of opposite valve. Fold rather high but not well distinguished from flanks; beginning slightly further back than sulcus and bearing two strong, wide, angulate or rounded ribs, which leave an intermediate groove of approximately equal width. Flanks smooth or bearing one rib on each. Ventral interior with rather large spondylium, sessile in posterior extreme and anteriorly elevated on median septum extending forward of it (see Pl. 30, figs. 23–26); spondylium occupying about one-third of valve length, with muscle tracks apparent on it. Both sides of median septum of gerontic specimens bearing thick ridges, becoming rather high, supporting sides of spondylium and continuing anteriorly to septum. Teeth small. Dorsal interior with rather long and narrow camarophorial trough on median septum, which increases in height forward to become very high and after that fades sharply (see Pl. 30, figs. 23, 24, 26); walls of camarophorium joining underside of hinge plate, camarophorium continuing free in anteroventral direction and extending further forward than spondylium of opposite valve. Hinge plate short, concave, except in its apex, where it bears a big

cardinal process of trigonal section and with lamellar myophore. Sockets long, narrow, located between lateral extreme of hinge plate and very narrow and low ridge separating them from valve wall. Crura initially following direction of camarophorium and later directing more ventrally. Intercamarophorial plate seen only in one specimen and reduced to very low and narrow elevation, located on posterior part of floor of camarophorium.

Discussion. The species is assigned to *Cyrolexis* because of its internal characteristics, although externally it resembles more closely some species of *Coledium* Grant, 1965. *Cyrolexis granti* is distinguished from *C. haquei* and other species of *Cyrolexis* by its transverse form, less numerous ribs on fold and sulcus, normally smooth flanks, and fold that is little differentiated from them. Exteriorly it looks like *Coledium explanatum* (McChesney, 1860) and particularly *C. globulinum* (Phillips, 1834) of Grant (1965*a*). It is distinguished from the former by the absence of the intercamarophorial plate, smaller size, more transverse form, and weaker ribs. In *C. globulinum* the presence of the intercamarophorial plate has not been firmly established; Grant (1965*a*, p. 120) says: 'intercamarophorial plate not observed, probably present', and Tschernyschew (1902) does not refer to it. If such a plate does not exist, *C. globulinum* could belong to *Cyrolexis* and it would be close to *C. granti*. Both differ externally by the more transverse form and even smaller size of the Cantabrian species. *C. granti* is now the oldest species attributed to the genus, which was considered restricted to the Permian.

Family STENOSCISMATIDAE Oehlert, 1887
Subfamily STENOSCISMATINAE Oehlert, 1887
Genus STENOSCISMA Conrad, 1839

1965*a* *Stenoscisma* Conrad; Grant, p. 138.

Type species. Terebratula schlotheimi von Buch, 1835.

Stenoscisma winkleri sp. nov.

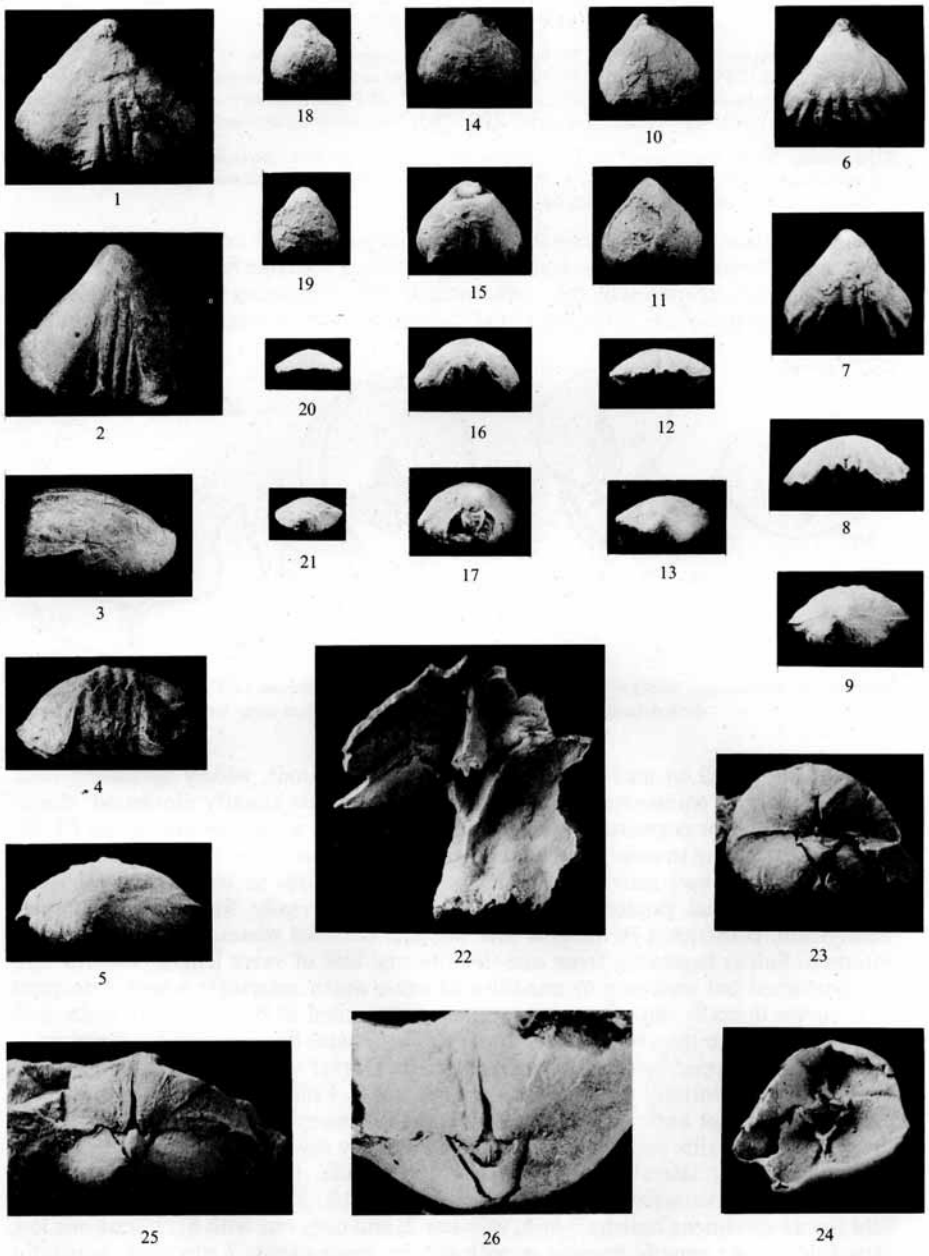
Plate 29, figs. 13, 14; Plate 30, figs. 1–22; text-figs. 6, 7

Derivation of name. Dedicated to Dr. C. F. Winkler Prins.

EXPLANATION OF PLATE 30

Figs. 1–22. *Stenoscisma winkleri* sp. nov. 1–5, ×2. Holotype, DPO 7005, dorsal, ventral, lateral, anterior, and posterior views showing the remains of the stolidium. 6–9, ×2. Paratype, DPO 7007, dorsal, ventral, anterior, and posterior views. 10–13, ×2. Paratype, DPO 7008, dorsal, ventral, anterior, and posterior views. 14–17, ×2. Paratype, DPO 7009, dorsal, ventral, anterior, and posterior views. 18–21, ×2. Paratype, DPO 7010, dorsal, ventral, anterior, and posterior views. 22, ×4. Paratype, DPO 7206, fragmentary specimen showing skeletal internal structures of the cardinal region; dorsal valve above.

Figs. 23–26. *Cyrolexis granti* sp. nov. 23, 24, ×5. Paratype, DPO 7286, internal mould of both valves and latex cast of posterior region showing spondylium and teeth in ventral valve and hinge plate and camarophorium without intercamarophorial plate in dorsal valve. 25, ×5. Paratype, DPO 7284, posterior view of an internal mould of both valves showing spondylium and camarophorium. 26, ×9. Inclined view of the same specimen to show mould of the cardinal process.

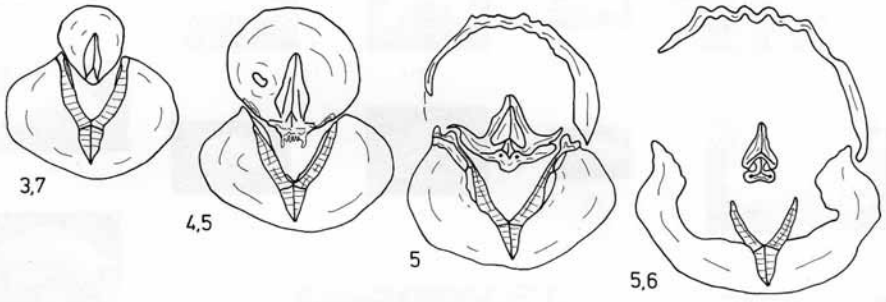


MARTINEZ-CHACON, Spanish Carboniferous Stenoscismatacea

Material. Holotype (DPO 7005, Pl. 30, figs. 1–5), 75 paratypes (DPO 7006–7076, 7142–7145) and 135 other specimens (DPO 7077–7141, 7146–7205) from the type locality; 5 paratypes (DPO 7206–7210) and 42 other specimens (DPO 7211–7252) from a locality NE. of Pinos (province of León = locality 29 of Winkler Prins, 1968), and 30 specimens (DPO 7253–7282) from other occurrences.

Type locality. Marly limestone of the Escalada Formation, at about 30 m above its base, of upper Kashirian age (according to van Ginkel, 1965), from a small cove on the coast north-east of Hontoria (province of Oviedo). Longitude 1° 41′ 43″, latitude 43° 27′ 8″.

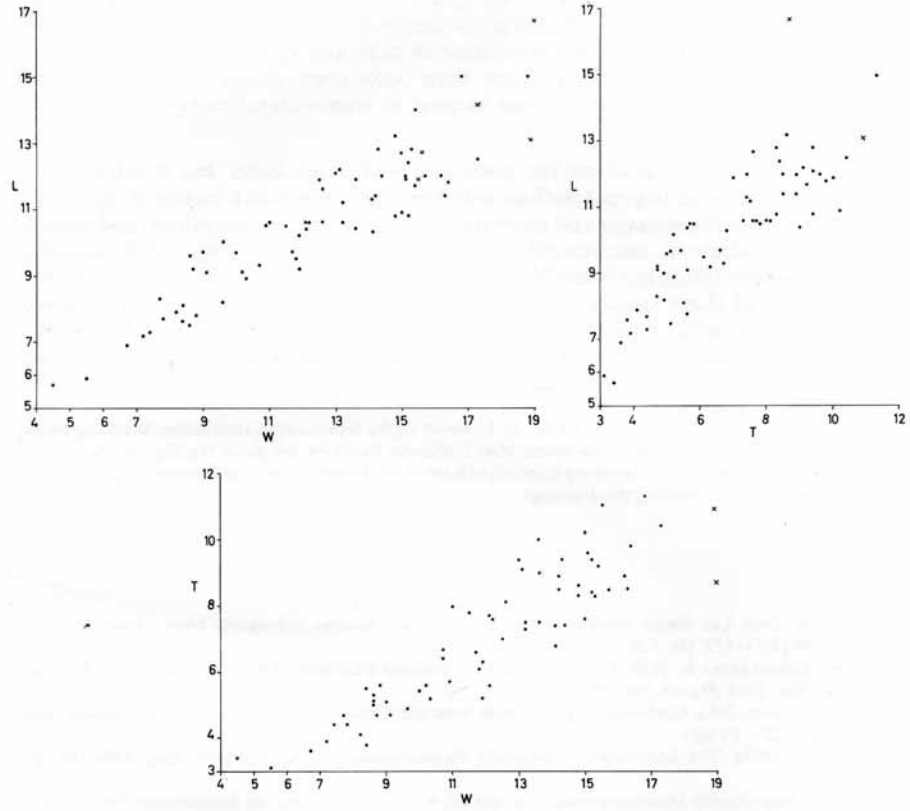
Diagnosis. Stenoscisma with trigonal outline, very expanded anteriorly, transverse. Fold normally with four to five strong ribs and sulcus with one fewer. Flanks smooth or with one, or exceptionally two, ribs on each. Ribs beginning rather far anteriorly to beak. Short stolidium, little developed and inappreciable for most of the specimens.



TEXT-FIG. 6. *Stenoscisma winkleri* sp. nov. Transverse sections of specimen DPO 7207 showing internal shell structures. Distances from the ventral beak in mm, ×4.

Description. Small to medium-sized shell, outline trigonal, widely spreading near anterior margin, transverse although juvenile specimens slightly elongated, dorsibiconvex; anterior commissure uniplicate. Stolidium in some specimens (see Pl. 30, figs. 1–5) extending to anterolateral and, sometimes, anterior margins of both valves, but always only very narrow, reaching a few millimetres in width. Ventral valve gently convex, beak pointed, and strongly incurved dorsally. Small and triangular delthyrium, constricted by narrow and disjunct deltidial plates, leaving triangular foramen. Sulcus beginning from one-third to one-half of valve length, shallow and flat-bottomed but widening to one-third of valve width anteriorly where it deepens as it curves dorsally into the tongue; sulcus is bounded at both sides by wider and more rounded rib than those of its floor. Posterolateral flanges strongly developed, high, and overlapped by those of opposite valve. Dorsal valve more strongly convex. Beak pointed, ventrally directed into ventral valve. Fold beginning at about mid-length, low except anteriorly where the flanks fall away steeply, top flat or gently arched. Median ribs wider than interspaces, slightly diverging forward, angular in most specimens; lateral ribs developed later in life, sometimes by bifurcation. Number of ribs variable (see Pl. 30, figs. 4, 8, 12, 16, 20), most frequently 4–5 on fold (some specimens bearing 3 or 6, very few 2, and only one with 8); sulcus one less than fold; flanks usually smooth or with one or, more rarely, 2 ribs each, generally

beginning further anteriorly; weaker than those on sulcus and fold. Growth lines usually weak, but occasionally stronger. Dimensions of the holotype in mm: L = 12,7; W = 15; T = 7,6. It bears 5 ribs on the fold. The dimensions of other specimens are in text-fig. 7.



TEXT-FIG. 7. Dimensions of *Stenoscisma winkleri* sp. nov. in mm. • specimens from the type locality; x specimens from locality 29 of Winkler Prins (1968), and from other localities nearby.

Ventral interior with wide spondylium supported by very low median septum duplex (see text-fig. 6 and Pl. 30, fig. 22), posterior part buried by secondary shell, so spondylium appears apically sessile; septum seen anteriorly with a height just over 1 mm, extending slightly anterior to spondylium; length of spondylium about one-third of valve length. Umbonal chambers can be full of secondary shell. Teeth strong, short, upper part rounded and each one having a lateral exterior crenulation. Dorsal interior with low and narrow camarophorial trough, anteroventrally directed and extending slightly in front of spondylium; supported by thin median septum

duplex, with height increasing towards anterior edge of trough, becoming very high, and from there decreasing parabolically, disappearing 1 or 2 mm anteriorly. Intercamarophorial plate duplex, high and long, occupying all the length of trough, posterior part supporting hinge plate. Posterior part of camarophorium can be buried by secondary shell and intercamarophorial plate not discernible to its anterior edge, in front of hinge plate. Hinge plate undivided, supporting on its apex a big and wide cardinal process, with myophore of high and thin lamellae; inner hinge plates extending rather more anteriorly than outer ones. Crura curving in ventral direction. Sockets narrow, short, and located at anterolateral extremities of outer hinge plates.

Discussion. *S. winkleri* is about the same size as *S. schlotheimi*, but it differs from the latter by its more trigonal outline with the maximum width nearly at the front, lower fold, generally stronger and more numerous ribs on fold and sulcus, and smaller developed stolidium. It also resembles *S. crumenum* (Martin, 1809) and *S. mutabile* (Tschernyschew, 1902), but is smaller, less thick, and its stolidium is less well developed than in both of these species; in addition *S. crumenum* has more strongly ribbed flanks and *S. mutabile* in adulthood is more fully ribbed than *S. winkleri*. The species is known from San Emiliano, Beleño, and Escalada Formations, which are upper Bashkirian to upper Kashirian age.

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