

Goniatites from the Viséan — Namurian junction beds in Palencia, NW Spain

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Late Viséan and basal Namurian goniatite faunas are described from two key localities in the province of Palencia, Cantabrian Mountains, NW Spain. The base of the Namurian is determined by *Cravenoceras leion* Bisat.

One new genus: *Revilloceras* and three new species: *Hypergoniatites reticulatus*, *Revilloceras globosum*, and *Dombarites cantina* are described here.

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Introduction

Special emphasis is placed in this paper on the goniatite faunas from the Viséan - Namurian junction beds. The specimens have been taken from grey nodular limestones (Genicera Formation; Wagner, Winkler Prins & Riding, 1971, p. 626 - 632) of the Revilla Nappe structure in the Barruelo region of NE Palencia (Wagner, 1971, p. 433 - 445). The conodont faunas have been recently described from the Revilla outcrop by Higgins (in Higgins & Wagner-Gentis, in press).

The earliest Namurian goniatite fauna in the Revilla Nappe is compared with an assemblage obtained from a dark grey shelly limestone outcrop 1500 m E of La Lastra, further west in Palencia. This outcrop was first recorded by A. Brants in a unpublished thesis for the University of Leiden (The Netherlands) in 1955, and can be found on the map of Frets (1965). The structure and stratigraphy of the La Lastra - Resoba area are presently under investigation by Drs R. H. Wagner and C. F. Winkler Prins.

A specimen collected by Brants from this outcrop was unidentifiable until it was joined to another piece of goniatite which was made available by Dr J. Kanis, without indication of locality. The reconstituted specimen proved to be *Platygoniatites eothalassoides*, indicating the E1 Zone. This stimulated a visit by Dr R. H. Wagner to Brant's locality, where he succeeded in finding another three species apart from the three already available. Amongst the three newcomers is *Cravenoceras leion*.

The material is deposited in the National Museum of Geology and Mineralogy of the Netherlands (Rijksmuseum van Geologie en Mineralogie, Leiden) under the registration numbers RGM 298 601 - 298 630.

Acknowledgements

I thank Dr R. H. Wagner for the provision of a large number of goniatites and Dr M. van den Boogaard for the lists of conodonts in this paper. The Department of Geology at the University of Sheffield kindly provided photographic facilities.

Stratigraphy

From the outcrop near Revilla de Santullán, loc. 134 of R. H. Wagner, the following species were collected in succession.

E 1	}	10 m	<i>Dombarites acicularis</i> (Pareyn)
			<i>Rhymoceras</i> cf. <i>Rh. perlatum</i> Ruzhencev & Bogoslovskaya
		9 m	<i>Tympanoceras</i> sp.
		8.5 m	<i>Syngastrioceras</i> sp. early form
			<i>Eumorphoceras</i> (<i>Tumulites</i>) sp., poor specimen, not described
		8.3 m	<i>Pachylyroceras</i> cf. <i>P. constrictum</i> Ruzhencev & Bogoslovskaya
	8 m	<i>Stenopronorites uralensis</i> (Karpinsky), not described	
	7 m	<i>Platygoniatites eothalassoides</i> (Wagner-Gentis)	

	nearly 2 m gap	
Goy or P2 or C ₁ V ₃	}	5.1 m <i>Goniatites granosus</i> Portlock <i>Pachyloceras</i> cf. <i>P. newsomi</i> (Smith)
		5 m <i>Dombarites acicularis</i> early form <i>Hypergoniatites reticulatus</i> sp. nov.
		4.5 m <i>Revilloceras barruelense</i> (Wagner-Gentis) <i>Dombarites granofalcatus</i> Kullmann
		4 m <i>Lusitanites subcircularis</i> (Miller) <i>Dombarites acicularis</i> early form <i>Stenopronorites</i> sp.
Goß	2 m gap	
	2 m	<i>Goniatites striatus</i> Sowerby

Localities 1711 and 1710 are blocks quarried from the above locality, which on the goniatite contents seem to fit between 4.5 and 5 m of the above succession. The conodonts of a sample of loc. 1711 are according to Dr M. van den Boogaard, personal communication, of the P2 Zone, which confirms this supposition.

He gave me the following lists: loc. 1711: *Gnathodus bilineatus bilineatus* (Roundy, 1926), *Gnathodus homopunctatus* Ziegler, 1960, *Gnathodus girtyi rhodesi*, Higgins, 1975, *Gnathodus girtyi collinsoni* Rhodes, Austin & Druce, 1969, *Paragnathodus commutatus* (Branson & Mehl, 1941), *Paragnathodus nodosus* (Bisschoff, 1957), and *Spathognathodus campbelli* Rexroad, 1957; loc. 134 at 4.5 m: *Gnathodus bilineatus bilineatus*, *Gnathodus homopunctatus*, *Paragnathodus commutatus*, and *Paragnathodus nodosus*.

Loc. 1710 - 1711 yielded the following goniatites:

Revilloceras barruelense (Wagner-Gentis)

Neogoniatites aff. *N. milleri milleri* Ruzhencev & Bogoslovskaya

Hypergoniatites reticulatus sp. nov.

Dombarites granofalcatus (Kullmann)

Dombarites cantina sp. nov.

Girtyoceras cf. *G. limatum* (Miller & Faber)

Kazakhoceras hawkinsi (Moore)

Stenopronorites barroisi (Karpinsky)

indicating the late Viséan, Goy, P2, or C₁V₃ Zone.

In an earlier publication by the author, in 1963, *Revilloceras barruelense* was assumed to have come from the E1 Zone, but in fact it is from the upper Viséan. The *Somoholites cadiconiformis* in the same paper was too poorly preserved for a definite identification, but could have been *Syngastrioceras* sp. 'early form'.

Locality 1401, at 700 m SE of Villabellaco church, forms part of the main outcrop of the Genicera Formation in the Revilla Nappe. *Revilloceras globosum* sp. nov. occurs here at c. 7 or 7.50 m above the faulted base of the formation (personal communication by Dr R. H. Wagner).

The dark grey shelly limestone of La Lastra is full of small and large specimens, which are generally well preserved.

This locality yielded the following species:

Dombarites acicularis (Pareyn)

Platygoniatites eothalassoides (Wagner-Gentis)

Cravenoceras leion Bisat

Cravenoceras shimanskyi Ruzhencev & Bogoslovskaya

Rhymmoceras gracilentum Ruzhencev & Bogoslovskaya

Stenopronorites uralensis (Karpinsky)

indicating the E1 zone.

The upper Viséan in NW Spain contains several species of worldwide occurrence, e.g. *Goniatites granosus*, *Lusitanites subcircularis*, and *Kazakhoce-
ras hawkinsi*. These occur together with such Spanish species as *Revilloceras
barruelense*, *Dombarites granofalcatus*, *Dombarites acicularis* early form, and
Stenopronorites barroisi, as well as a large number of elements recorded from
the South Urals, viz. *Dombarites cantina* (similar to *D. parafalcatoides*),
Hypergoniatites reticulatus (similar to *H. exiguus*), and *Neogoniatites* aff. *N.
milleri milleri*. There are also a few North American species, viz. *Girtyoceras*
cf. *G. limatum* and *Pachylyroceras* cf. *P. newsomi* (*P. newsomi* has also been
recorded from West Germany, England, and North Africa, but these occur-
rences are questioned by Gordon, 1964).

The basal Namurian fauna, however, is wholly Tethyan, with a predomi-
nance of species described from the South Urals. The following taxa have
been found: *Platygoniatites eothalassoides* (comparable to *P. omniliratus*),
Rhymmoceras cf. *Rh. perlatum*, *Rhymmoceras gracilentum* (also known from
Yugoslavia), *Cravenoceras shimanskyi*, *Pachylyroceras* cf. *P. constrictum*,
Tympanoceras sp., *Stenopronorites uralensis* (also known from North Africa)
whilst *Syngastrioceras* is more widespread, i.e. China, U.S.A. and the Urals.
The genus *Dombarites* is well represented in the Urals and also occurs in
North Africa and the U.S.A., whilst the species *D. acicularis* only occurs in
North Africa and NW Spain. The only odd one out is *Cravenoceras leion*, the
basal Namurian index, which is known from England, Belgium and Germany.

Conclusions

In NW Spain (Palencia, León) a fairly cosmopolitan fauna has been found in
the upper Viséan, changing into a completely Tethyan fauna in the lower Na-
murian.

The base of the Namurian in NW Spain can be recognised by *Platygoni-
atites eothalassoides*, *Dombarites acicularis* and *Stenopronorites uralensis*. The
additional find of *Cravenoceras leion* in the locality near La Lastra (Palencia)
together with the above mentioned species a.o. (see previous pages) confirms
this base to be at the base of the E1 Zone.

The proposal of Ruzhencev & Bogoslovskaya, 1971, to incorporate the
uppermost Viséan with the Namurian (P2 = Nm_{1a}) on the basis of a change in
generic composition of goniatite faunas, is not supported in this area.

Also the genera: *Tympanoceras*, *Cravenoceras*, *Rhymmoceras*, and *Syn-
gastrioceras* start to occur in the E1 Zone.

Systematic descriptions

Family GONIATITIDAE de Haan, 1825
Genus *Goniatites* de Haan, 1825

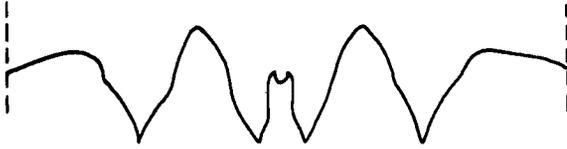


Fig. 1. *Goniatites granosus* Portlock, from loc. 134, Revilla at 5.1 m above the base; RGM 298 604; suture, $\times 3$.

Goniatites granosus Portlock, 1843
Pl. 2, fig. 1; Fig. 1.

- 1843 *Goniatites granosus* Portlock, p. 407, pl. 29A, fig. 9.
 1925 *Glyphioceras granosus* Portlock — Schmidt, p. 570 - 572, pl. 21, figs. 8 - 9 (non fig. 10); pl. 23, figs. 21 - 22, 24 (non figs. 19 - 20, 23).
 1936 *Goniatites granosus* Portlock — Moore, p. 176, pl. 3, figs. 1, 4 - 6, 10, 12.
 1938 *Goniatites granosus* Portlock — Librovitch, p. 90 - 92, pl. 1, fig. 1a - e.
 1961 *Goniatites* — *Mesoglyphioceras* — *granosus* Portlock — Pareyn, p. 153 - 156, pl. 17, figs. 1 - 6; text-figs. 17 B - C, 18 A - C.
 1964 *Goniatites granosus* Portlock — Gordon, p. 192 - 194, pl. 18, figs. 7, 13 - 16; text-figs. 44 I, 49.
 1971 *Goniatites granosus* Portlock — Zakowa, p. 60 - 61, pl. 9, figs. 1 - 3 (non pl. 10, figs. 1 - 2).

Material — One small specimen showing shape, ornament and suture.

Description — The specimen is involute and sphaerocone. Cross-section of the whorl is parabola-shaped. Umbilicus small.

The constriction is rather weathered, but apparently crosses the whorl in a straight line. Ornament consisting of c. 35 longitudinal striae between the middle of the venter and the umbilical edge. Much finer transverse lirae cross the longitudinal striae in a straight line and produce granules on the crossing points.

The suture (Fig. 1) consists of a ventral lobe with diverging sides and pointed secondary lobes; the fairly high median saddle reaches about 60% of the ventral lobe. The ventro-lateral saddles are bluntly pointed. Lateral lobes are bell-shaped with a sharp point; second lateral saddles are asymmetrical, wide and rounded. The umbilical lobe is not visible.

Dimensions — D = 23 mm; W = 16 mm; h = 6 mm; U = 2 mm.

Remarks — The holotype of *Goniatites granosus* Portlock does not show a suture line and comparison is made with Moore's (1936, pl. 3, fig. 10) specimen from Dinckley (Yorkshire, England).

Comparisons — The suture of the specimen from Revilla differs from that of *Dombarites acicularis* in having shorter ventro-lateral saddles; furthermore, the genus *Dombarites* has much more triangular shaped lateral lobes than *Goniatites*. The ornament of *Revilloceras barruelense* and *Goniatites granosus* is virtually the same, but the longitudinal striae are more widely spaced near the umbilical margin in *R. barruelense*. Their suture lines are quite different.

Occurrence — *Goniatites granosus* Portlock has a worldwide distribution in the uppermost Viséan. In the Revilla outcrop (loc. 134), it occurs at 5.1 m above the base, together with *Dombarites acicularis* 'early form', indicating upper Viséan (Goy, P2, or C_{1v3}).

Genus *Neogoniatites* Ruzhencev & Bogoslovskaya, 1970

Neogoniatites aff. *N. milleri milleri* Ruzhencev & Bogoslovskaya, 1970
Pl. 2, fig. 2a - c; Fig. 2.

vide 1971 *Neogoniatites milleri milleri* Ruzhencev & Bogoslovskaya, p. 211 - 212, pl. 10, figs. 5 - 7, text-fig. 36 b,v.

Material — Shell, showing shape, ornament and suture.

Description — The shell is an involute ellipsocone, with a very small, probably closed umbilicus. The outline of the whorl is parabola-shaped.

There are no constrictions. The ornament is very fine and consists of transverse lamellae which have the tendency to become crenulate, in particular near the venter. They form a wide and shallow sinus on the sides, a salient on the ventro-lateral part and a sinus on the venter.

The suture (Fig. 2) consists of a wide ventral lobe with thick pointed secondary lobes. The median saddle at H = 17 mm reaches 50% of the depth of the lobe. The sides of the ventral lobe diverge in smooth curves to the blunted tips of the ventro-lateral saddles. The inflated lateral lobes are pointed. The second lateral saddles are asymmetrical, rounded and wide. They are not completely visible.



Fig. 2. *Neogoniatites* aff. *N. milleri milleri* Ruzhencev & Bogoslovskaya, from loc. 1711, Revilla; RGM 298 605; suture, $\times 3$.

Dimensions — D = 45 mm; W = 6 mm; H = c. 22 mm; h = c. 15 mm; U = c. 4 mm.

Discussion — Our specimen has the same dimensions and ornament as *Neogoniatites milleri milleri* described by Ruzhencev and Bogoslovskaya in 1971. Their text-fig. 36b shows a suture of which the median saddle is 50% of the ventral lobe with H = 10.9 mm, at H = 17 mm it is 60%; whereas the median saddle of the Revilla specimen at H = 17 mm still measures 50%.

Occurrence — Loc. 1711, near Revilla, together with *Revilloceras barruelense* and *Dombarites granofalcatius* and other species indicating the upper Viséan (Goy, P2, or C_{1v3}).

In the Dombar river valley, southern Urals, indicating the Nm_{1a_1} - Nm_{1b_1} of Ruzhencev's connotation.

Genus *Hypergoniatites* Ruzhencev & Bogoslovskaya, 1970

Hypergoniatites reticulatus sp. nov.

Pl. 2, figs. 3-4; Fig. 3.

Holotype — Shell (RGM 298 607) showing the shape and sutures (Pl. 2, fig. 4).

Paratype — Fragment (RGM 298 606) showing the ornament (Pl. 2, fig. 3).

Type locality — Loc. 1711, Revilla de Santullán (Palencia).

Type horizon — Upper Viséan beds of the Genicera Formation (Goy, P2, or C_{1v_3}).

Derivatio nominis — This species is named *reticulatus* after its reticulate ornamentation.

Diagnosis — Sutures identical to that of *Hypergoniatites exiguus* Ruzhencev & Bogoslovskaya (1971, p. 214 - 215, text-fig. 38, pl. 11, figs. 5 - 7). The very fine transverse ornament follows the same course as in *H. exiguus*, but it is also crossed by a finer and more closely set longitudinal ornament, thus producing a reticulate pattern.

Material — Holotype, paratype and one additional specimen showing shape of shell, sutures and the ornament, all from a grey nodular limestone block (loc. 1711) known to have been quarried near Revilla. A further specimen collected at loc. 134, near Revilla, at 5 m above the exposed base, is slightly distorted and septate.

Description — Shell involute with a strongly rounded venter continuing without break into the rounded sides. The greatest width is near the umbilicus. Cross-section of the whorl is parabola-shaped. Umbilicus very small.

No constrictions. Ornament consists of fine transverse lirae forming a deep sinus on the lateral side, a shallow salient on the ventro-lateral side and again a deep sinus on the ventral side. This transverse ornament, very slightly cancellate in appearance, is crossed by extremely fine and closely set longitudinal lirae which are sometimes hardly visible. Where the ornament is well preserved a reticulate pattern is apparent.

The suture (Fig. 3) consists of a deep ventral lobe with sharply pointed secondary lobes with a narrow base and uninterruptedly diverging sides. The median saddle is slim, with parallel sides; it reaches up to 40% of the depth of the ventral lobe. Ventro-lateral saddles are pointed and large A-shaped. They

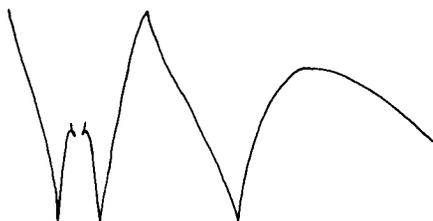


Fig. 3. *Hypergoniatites reticulatus* sp. nov., from loc. 1711, Revilla; RGM 298 607; suture of holotype, $\times 3$.

are followed by very acute, large V-shaped lateral lobes. The second lateral saddles are asymmetrical, wide and rounded; they terminate in the umbilicus. The umbilical lobe is not visible. The suture lines are very closely spaced, 6 per quarter whorl.

Dimensions (in mm)

RGM No.	298 607	298 606	(all from loc. 1711)
D (diameter)	28	30	32
W (width)	20	c. 20	20
H (height of whorl)	15	18	17
h (height of opening)	10	9	10
U (umbilicus)	1	2	2.5

Comparisons — As stated in the diagnosis, this species has the same shape, suture and transverse ornament as in *Hypergoniatites exiguus*, but differs in possessing also longitudinal striae.

Occurrence — Near Revilla de Santullán (Palencia), in association with *Revilloceras barruelense*, *Goniatites granosus* and other species from the Upper Viséan beds of the Genicera Formation (Goy, P2, or C_{1v3} Zone).

The closely related *Hypergoniatites exiguus* Ruzhencev & Bogoslovskaya occurs in the lower Namurian Nm_{1a1} - a₂ of the Dombar river valley, South Urals. Popov (1975, p. 121) recorded it from upper Viséan (C_{1v3}) strata in the South Urals.

Genus *Dombarites* Librovtich, 1957

Remarks — The suture lines belonging to the genus *Dombarites* are rather remote in an evolutionary sense from the sutures in the genus *Agathiceras*, but very close to the sutures in the genus *Goniatites*. Therefore, I prefer to include the genus *Dombarites* in the family of the Goniatitidae.

Another point is that, since the outline of the sutures belonging to the genus *Dombarites* is very distinctive, it seems rather artificial not to include species which haven't got the required height of median saddle, i.e. 65% of the ventral lobe (Ruzhencev & Bogoslovskaya, 1970, p. 507). I therefore propose to include species with a median saddle from 45% of the ventral lobe onwards within the genus *Dombarites*.

Further species to add to the list of *Dombarites* species by Ruzhencev & Bogoslovskaya (1970, p. 507) are:

orientalis (Librovitch, 1940) (*Goniatites*)

cantina sp. nov.

acicularis early form (see below)

granofalcatus (Kullmann, 1961) (*Goniatites*)

Dombarites acicularis (Pareyn, 1961)

Pl. 3, fig. 3; Pl. 4, figs. 1 - 4; Figs. 4 - 5.

1961 *Mesoglyphioceras granosus* Portlock var. *aciculare* Pareyn, p. 157 - 159; pl. 17, figs. 13 - 18; pl. 18, figs. 1 - 9, 11 (non figs. 10, 12 - 17).

1963 *Mesoglyphioceras granosus* var. *aciculare* Pareyn — Wagner-Gentis, p. 12 - 13, pl. 1, 2a - d, 4.

1970 *Dombarites acicularis* Pareyn — Ruzhencev & Bogoslovskaya, p. 507.

1972 *Goniatites* — *Mesoglyphioceras* — *granosus* Portlock var. *aciculare* Pareyn — Drahovzal & Quin, text-fig. 5.

Material — Two specimens, showing mainly the ornament but also sutures, from near La Lastra; also several poorly preserved or fragmentary specimens showing sutures and traces of ornament, from Revilla; and one specimen with the ornament and part of the sutures from Entrago (for a description of this locality in the province of Oviedo see Budinger & Kullmann, 1964).

Description — The shell is an involute ellipsocone with rounded venter and sides. Maximum width near the umbilicus which is small and open.

Each whorl has three narrow and fairly deep constrictions which cross the sides and the venter in a straight line. Ornament consists of c. 45 longitudinal striae per half whorl; they are crossed by very fine transverse lirae which lean very slightly backwards about halfway the lateral sides and cross the venter with a hardly perceptible sinus. One of the specimens from La Lastra shows this ornament on an early part of the whorl, whilst the transverse lirae become stronger and a reticulate pattern emerges on a later part. Superimposed on part of this reticulate pattern are some fine furrows immediately next to a growth lira. About three or four transverse lirae occur between furrows.

The suture (Fig. 4) consists of a ventral lobe with pointed secondary lobes and a generally high median saddle. The sides of the ventral lobe diverge from the tip of the secondary lobes up to halfway the lobe, where they straighten out for a short distance before diverging again to the tip of the ventro-lateral saddles. The latter are pointed and long in comparison with the ones in *Goniatites granosus*. The succeeding lateral lobes are triangular with long narrow points. The second lateral saddle is asymmetrical, wide and rounded; it ends in the umbilicus. The umbilical lobe is not visible.

Dimensions (in mm)

RGM No.	298 612 Revilla	298 610 at 8 m	— at 10 m	— at 4 m	298 613 at 5 m	298 611 La Lastra	298 614 Entrago	—
D	—	—	—	c. 18	16	26	27	—
W	12	10	10	c. 11	9	16	16	12
H	10	12	12	10	7	12	11	11
h	3	—	—	—	—	—	—	—
U	2	—	—	—	1.5	c. 4	c. 3	—
Height of median saddle	56%	60%	60%	—	c. 45%	61%	66%	66%

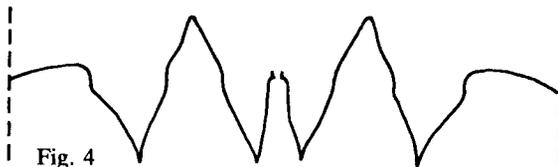


Fig. 4

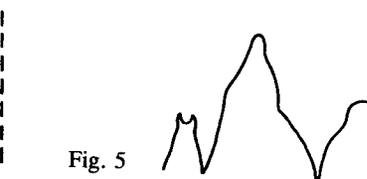


Fig. 5

Fig. 4. *Dombarites acicularis* (Pareyn), from loc. 134, Revilla at 10 m above the base; RGM 298 610; suture, $\times 3$.

Fig. 5. *Dombarites acicularis* early form, from loc. 134, Revilla at 5 m above the base; RGM 298 613; suture, $\times 3$.

Discussion — Revilla, loc. 134, apparently contains two groups of *Dombarites acicularis*. Their sutures are identical apart from the height of the median saddle. The ones with a median saddle below 50% of the ventral lobe are found at 4 and 5.1 m from the base, and these are called here 'early forms'; the others, with a median saddle above 50% of the ventral lobe, are the true *Dombarites acicularis* from the lower Namurian, E1 Zone. These occur at 8 m and 10 m above the base of the limestone outcrop near Revilla.

The early forms do not entirely comply with the requirements for the genus *Dombarites* as in Ruzhencev & Bogoslovskaya (1971, p. 507) because of their relatively low median saddle, but they have the tall pointed ventro-lateral saddles and possess the clearly triangular lateral lobe tending to a trifid shape (Fig. 5). However, with the emended description (see genus *Dombarites*), they can be included in this genus. Unfortunately, the material is not well enough preserved to justify the creation of a new subspecies for the 'early form'.

The changes in ornament on the specimen from La Lastra, where fine transverse lirae give way to coarse transverse lirae and where transverse furrows appear, may perhaps be ascribed to climatic or general environmental changes during the life span of this particular individual.

Comparisons — The suture compares well with that of *Dombarites parafalcatoides* Ruzhencev & Bogoslovskaya (1971, p. 232, text-fig. 40), but this species is characterised by a different transverse ornament. It is also similar to *Dombarites mapesi* (Drahovzal & Quinn, 1972) (p. 587), but differs as stated by them.

Occurrence — The 'early form' occurs in the upper Viséan (Goy, or P2 Zone) of the grey nodular limestone, the Genicera Formation of Revilla de Santullán; whereas *D. acicularis* proper occurs in the higher part of that same limestone, belonging to the lower Namurian (E1 Zone); as well as the strata of equivalent age near La Lastra.

In North Africa this species occurs in the Lower Namurian, S4a and S4b of Pareyn's zonation.

Dombarites granofalcatus (Kullmann, 1961)
Pl. 1, figs. 2 - 4; Fig. 6A - B.

1961 *Goniatites (Goniatites) granofalcatus* Kullmann, p. 305 - 308, pl. 22, figs. 1 - 2.

Material — One very well preserved specimen found loose near Villabellaco and apparently derived from quarrying operations in loc. 138, Villabellaco limestone (Genicera Formation); one specimen found in situ in locality 134 and several specimens from a loose block, loc. 1711, derived from loc. 134, Revilla de Santullán.

Description — The shell is an involute ellipsocone. The venter and ventro-lateral shoulders are rounded. The lateral sides are almost flat. In cross-section the whorl looks like a rectangle with rounded edges. The greatest width is near the umbilicus, which is on average 54% of the diameter.

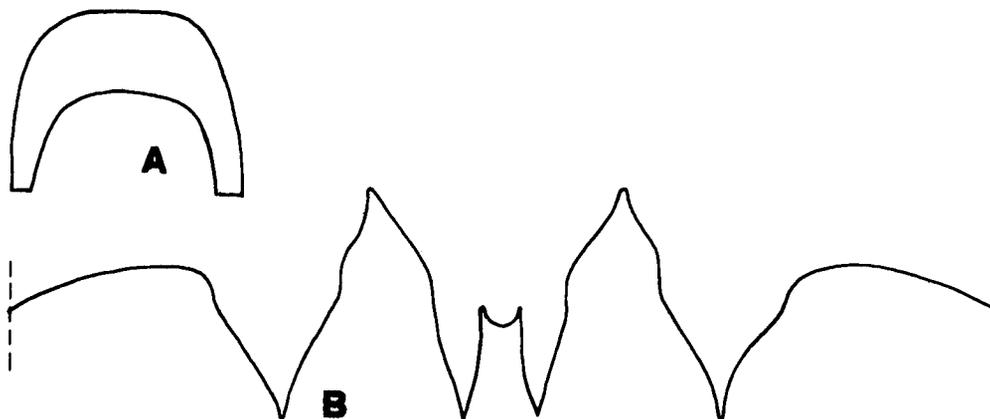


Fig. 6. *Dombarites granofalcatus* (Kullmann), from loc. 1711, Revilla; RGM 298 601; A: cross-section, $\times 1$; B: suture, $\times 2$.

The ornament consists of 35 strong longitudinal striae, between the middle of the venter and the umbilical edge. They are crossed by finer transverse lirae which, at regular intervals, produce granules on the crossing points. This is only visible when the ornament is well preserved. The direction of the transverse ornament is as follows: from the umbilical edge the lirae bend forwards to one-quarter of the side; then they bend gradually backwards and form a shallow sinus on the ventro-lateral area; just past this area, on the venter, they bend forwards, sometimes in a rounded and sometimes in a more angular way, thus forming an angular to rounded salient followed by a shallow sinus crossing mid-venter. One specimen shows a good cross-section of the shell (Pl. 1, fig. 1a) as well as the ornament (Pl. 1, fig. 1b) which shows c. 3 fine transverse lirae in the intervals between the stronger transverse lirae which produce the granular effect with the longitudinal striae. Another, rather stout specimen (Pl. 1, fig. 3) shows falcatoïd steps at regular intervals, changing into regularly disposed strong transverse lirae and then back into falcatoïd steps. The steps are more widely spaced than the strong transverse lirae. Constrictions follow the same direction as the transverse lirae. There are probably four constrictions per whorl.

The suture (see Fig. 6B) consists of a ventral lobe with long, narrow, pointed secondary lobes. The median saddle reaches to about 50% of the depth of the ventral lobe. The sides of the ventral lobe start diverging from the tips of the secondary lobes and increase the angle of divergence just above the median saddle. The ventral saddles are pointed. The following lobe, situated on the ventro-lateral area, is bell-shaped with its long and sharp point just on the lateral side. This lobe is followed by an asymmetrical, wide and rounded saddle which ends on the umbilical edge.

Comparisons — *Dombarites granofalcatus* is comparable to *Dombarites falcatoides* Ruzhencev & Bogoslovskaya (1971, pl. 15, fig. 1a - b) and *Dombarites parafalcatoides* (op. cit., pl. 17, fig. 8a - b) with regard to the general aspect of the ornament, but it possesses a more rectangular cross-section and a larger umbilicus. The Russian specimens also show more divergent sides to a ventral lobe. With a comparable height of whorl *D. falcatoides* has a higher median

saddle than *D. granofalcatus* (*D. parafalcatooides* has a comparable height of median saddle).

Dimensions (in mm)

RGM No.	298 602	298 601	298 630 (preceding whorl)	298 603
D	76	64	67	c. 65
W	48	36	34	32
H	33	22	27	25
h	—	9	11	10
U	20	18	22.5	19
Width of venter	—	—	24	22

Occurrence — Montó area, León (Kullmann, 1961); in Palencia in grey nodular limestone, Genicera Formation, near Revilla, loc. 134, at 4.5 m above the exposed base, and at 12 m above the base in loc. 138 near Villabellaco in the *Paragnathodus multinodosus* zone (Higgins & Wagner-Gentis, in press). It occurs together with *Revilloceras barruelense* and *Hypergoniatites reticulatus*, indicating the upper Viséan (Goy, P2, or C₁v₃ Zone).

Dombarites cantina sp. nov.

Pl. 4, fig. 5a - b; Fig. 7.

Holotype — Shell (RGM 298 628) showing shape, ornament and suture (Pl. 4, fig. 5a - b).

Type locality — Loc. 1711, Revilla de Santullán.

Type horizon — Upper Viséan beds of the Genicera Formation (Goy, P2, or C₁v₃).

Diagnosis — Shape and sutures identical to *Dombarites parafalcatooides* Ruzhencev & Bogoslovskaya (1971, p. 231 - 232, pl. 17, figs. 4 - 8, text-fig. 49). Four constrictions per whorl, which cross the sides in a straight line and form a wide and shallow sinus on the venter. The ornament consists of 35 to 37 strong longitudinal striae per half whorl, which are crossed by fine transverse lirae, probably following the same direction as the constrictions.

Material — Holotype and two smaller additional specimens. The holotype shows shape, ornament and suture; the smaller specimens show shape and ornament. All specimens are from a grey nodular limestone block (loc. 1711), quarried near Revilla, but encountered next to a cantina (inn) hence the name of the species.

Description — The holotype is large and discoidal with a small umbilicus. The two smaller specimens are also involute platycones. They all have a strongly rounded venter which curves into nearly flat sides. The width is about half the diameter.

There are four fairly deep and broad constrictions per whorl, which do not cut the umbilical edge but seem to fade away near the umbilicus. They cross the sides in a straight line and form a wide and shallow sinus on the venter. The ornament consists of 35 longitudinal striae per halfwhorl, which are crossed by very fine transverse lirae. On the holotype the transverse lirae are barely visible and it is therefore difficult to see how they cross the longitudi-

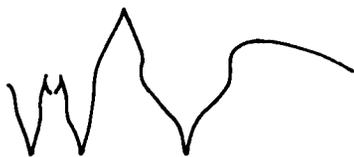


Fig. 7. *Dombarites cantina* sp. nov., from loc. 1711, Revilla; RGM 298 628; suture of holotype, $\times 1$.

nal striae; however they appear to cross the sides in a straight line and make a very shallow and wide sinus on the venter.

The suture (Fig. 7) consists of a ventral lobe, of which the median saddle reaches half the height of the lobe. The secondary lobes are long, narrow and pointed. The sides of the ventral lobe diverge from the tip of the secondary lobes to halfway the ventral lobe from which point they diverge stronger outwards. The ventro-lateral saddles are fairly long, narrow and pointed. The lateral lobes are triangular with a long narrow point. The sides of the lobe show the tendency to become trifid, which is typical of *Dombarites*. The second lateral saddles are asymmetrical, wide and rounded.

Dimensions (in mm)

	RGM 298 628 (holotype)	other specimens	
D	67	31	20
W	c. 33	15	10
H	—	—	8
h	—	5.5	—
U	11	—	c. 3.5

Comparisons — As stated in the diagnosis, this species has the same shape and suture as *D. parafalcatoides*, but differs in having 35 longitudinal striae per half-whorl instead of 40 - 43 and does not possess a falcatoid transverse ornament.

Occurrence — In the Genicera Formation at Revilla (loc. 1711) in association with *Revilloceras barruelense* and other species, indicating the upper Viséan (Goy, or P2 Zone).

The closely related *Dombarites parafalcatoides* occurs in the Dombar valley, South Urals in the $Nm_{1a_1} - a_2$ of Ruzhencev's connotation.

Genus *Revilloceras* gen. nov.

Type species — *Mesoglyphioceras granosus* var. *barruelense* Wagner-Gentis, 1963.

Derivatio nominis — This genus is named after the locality Revilla.

Diagnosis — Shell involute, shape varies from sphaerocone to ellipsocone. The rounded venter passes gradually into the rounded sides. Umbilicus from small to medium sized.

Constrictions present. Ornament consists of longitudinal striae crossed by transverse lirae.

Suture of fully mature specimens the same as in the immature *Dombarites*.

Comparisons — In the genus *Revilloceras* the sides of the ventral lobe do not diverge a great deal as in the genus *Dombarites* but remain more parallel; nor do the ventro-lateral saddles become long and pointed, they are triangular with blunted tips. The lateral lobes are the same as in *Dombarites*; they also show a tendency to trifidity.

The suture has elements of the genus *Syngastrioceras*, but its ventral lobe is not as wide, nor is the median saddle as broad.

Species — To this genus belong:

- barruelensis* (Wagner-Gentis, 1963) (= *Mesoglyphioceras granosus* var. *barruelense*)
globosum sp. nov.

Occurrence — Upper Viséan (Goy, P2, or C_{1v3} Zone) of Northwest Spain and Germany.

Remarks — In Kullmann & Pitz (1980, Abb. 4C; Abb. 5, fig. 3a - c) the sutures of specimen no. 425 are not the same as in the lectotype of *poststriatus* Brüning, Abb. 4B. The suture of the former resembles that of the genus *Revilloceras*. Abb. 4A, D and E are different as well from the lectotype. They possess a very wide ventral lobe and may well belong to a new genus also in the group of *Dombarites* and *Revilloceras*. Abb. 5, fig. 4b does not resemble the lectotype either. The suture of the lectotype, as drawn in Abb. 4B, resembles that of the genus *Neogoniatites*.

Revilloceras barruelense (Wagner-Gentis, 1963)
 Pl. 5, figs. 2 - 3; Fig. 8A - C.

- 1963 *Mesoglyphioceras granosus* var. *barruelense* Wagner-Gentis, p. 11 - 12, pl. 2, fig. 1a - b; pl. 5, fig. 1a - b.
 1979 *Dombarites barruelensis* (Wagner-Gentis) — Kullmann, in list on p. 193.

Topotype — Shell (RGM 298 615) showing shape, ornament and suture (Pl. 5, fig. 2).



Fig. 8. *Revilloceras barruelense* (Wagner-Gentis); A: from loc. 134, Revilla at 4.5 m above the base; RGM 298 616; sketch of cross-section, $\times 1$; B: from loc. 1711, Revilla; RGM 298 615; suture topotype at D = 24 mm, $\times 3$; C: from loc. 1711, Revilla; suture at D = 12 mm, $\times 3$.

Material — Holotype, one septate specimen, found loose in loc. 134, Revilla; one topotype (RGM 298 615), a very well preserved specimen showing shape, ornament and suture (Pl. 5, fig. 2) from loc. 1711, Revilla; one specimen with suture on one whorl and across the ornamentation of another whorl — partially the internal suture — from loc. 1710; and one specimen, showing shape and suture, from loc. 134 at 4.5 m above the base.

Emended diagnosis — This is based on the much better preserved topotype. Shape involute, ellipsocone with rounded venter and rounded sides. Umbilicus about one quarter of the diameter. Umbilical edge narrowly rounded and umbilical wall at right angles to the sides.

Three constrictions per whorl. They are shallow to non-existent near the umbilicus, cross the sides deeply in a straight line and on the venter form a shallow sinus. Ornament consists of 35 longitudinal striae per half-whorl, crossed by very fine and closely set transverse lirae, forming fine granules on the crossing points. Ornament in general similar to that of *Goniatites granosus*, but possesses c. 35 instead of c. 40 longitudinal striae.

Suture as for genus *Revilloceras*.

Description — See emended diagnosis. The constrictions are not always entirely straight on the sides. The transverse lirae leave the umbilicus in a forward direction and form a shallow salient at the point where the constriction deepens on the lateral side. They then continue to follow the direction of the constrictions. On some of the specimens the spacing of the longitudinal striae around the umbilical edge is not always the same.

The suture (Fig. 8B) consists of a ventral lobe with narrow, sharply pointed secondary lobes. The median saddle reaches 50% to 52% of the depth of the ventral lobe in maturity. The sides of the ventral lobe are parallel to slightly constricted just above the top of the median saddle. From that point onwards they diverge to form triangular ventro-lateral saddles with blunt tips. The lower part of the sides are parallel over a short distance. The following lateral lobes are parallel-sided at first and then commence to form a triangular base with a long narrow point. Second lateral saddles are asymmetrical, wide and rounded; they terminate on the umbilical wall with a small, narrow pointed lobe. The internal suture is poorly visible, but probably consists of three narrow pointed lobes, which are inflated in the middle. On each side of the dorsal lobe are rounded saddles, which are narrow and inflated. The lateral saddles are asymmetrical, wide and rounded.

Dimensions (in mm)

RGM	—	298 616	298 615
	holotype	at 4.5 m	topotype
D	34	24	40
W	c. 20	c. 15	24
H	16	c. 8	16
h	6	4.5	6
U	5 ?	—	9

Comparisons — *Revilloceras barruelense* differs from *Goniatites granosus* by its wider spaced longitudinal striae (35 per half-whorl as against 40 in *G. granosus*). The ornament is otherwise very similar. The sutures are very diffe-

rent (compare with sutures as figured by Moore, 1936, pl. 3, figs. 10, 12). *Dombarites globiformis* (Kullmann, 1961, p. 294) has many more longitudinal striae per half-whorl. It differs from *Dombarites acicularis* (Pareyn) in having a different suture in maturity and possessing fewer longitudinal striae.

Occurrence — In the Genicera Formation at Revilla de Santullán, loc. 134 at 4.5 m above the base, at loc. 1711 and loc. 1710 in association with *Goniatites granofalcatus* of late Viséan age (Goy, P2, or C₁V₃ Zone).

Revilloceras globosum sp. nov.
Pl. 5, fig. 1; Fig. 9A - B.

Holotype — Fragment showing whorl shape and sutures (RGM 298 617) (Pl. 5, fig. 1; Fig. 9A - B).

Type locality — Loc. 1401, near Villabellaco, Palencia, at 7.5 m from the base of the exposure.

Type horizon — Upper Viséan beds of the Genicera Formation (Goy, P2, or C₁V₃).

Material — Holotype and three more specimens from the Genicera Formation at Villabellaco (loc. 1401) and one additional specimen from the red nodular limestone (Canalón Member of the Genicera Formation) of loc. 358 near Pola de Gordón (León) (for this locality see Wagner, 1963).

Diagnosis — Involute sphaerocone, D:W = 15:14, with an open umbilicus. Ornament consisting of longitudinal striae (D = c. 40 mm, at venter three longitudinal striae per mm). Suture as in genus *Revilloceras*.

Description — As in diagnosis. Dimensions, here below, indicate a narrowing of the umbilicus, when the specimen becomes larger; however the preservation is not good enough to be certain.

On the smallest specimen the constrictions are partially preserved. The ornament consists of longitudinal striae, but the total number per half-whorl cannot be counted.

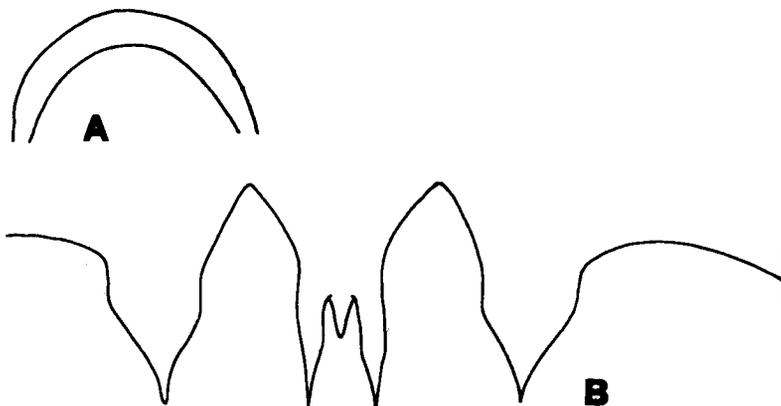


Fig. 9. *Revilloceras globosum* sp. nov., from loc. 1401, Villabellaco limestone at 7.5 m above the base; RGM 298 617; holotype; A: sketch of cross-section of whorl, $\times 1$; B: suture, $\times 3$.

The suture (Fig. 9B) of the holotype shows the parallel-sided ventral lobe very clearly. The sides start diverging above the median saddle to form the triangle-shaped ventro-lateral saddles with blunted apices. At the places where the suture is worn the apices make sometimes a rounded impression. The lateral lobes have a short stretch of parallel sides which converge later to form a triangular base with a long narrow point; the second lateral saddles are asymmetrical, wide and rounded. No umbilical lobes are visible.

Dimensions (in mm)

RGM No.	298 617	—	— (all loc. 1401)
D	34	16	25
W	32	14	21
H	10	—	10
h	6	—	—
U	6	4	—

Comparisons — *Revilloceras globosum* is comparable to *R. barruelense* but differs in having a wider shell, more longitudinal striae and, proportionately, a narrower ventral lobe.

Occurrence — In the Genicera Formation, at about 7.5 m from the base of loc. 1401, near Villabellaco, and from loc. 358, a quarry near Pola de Gordón (León), in deposits of late Viséan age.

Family DELEPINOCERATIDAE Ruzhencev, 1957

Genus *Platygoniattites* Ruzhencev, 1956

Platygoniattites eothalassoides (Wagner-Gentis, 1963)

Pl. 3, figs. 1 - 3; Fig. 10.

1963 *Delepinoceras eothalassoide* Wagner-Gentis, p. 15 - 16, pl. 3, fig. 3a - b; pl. 4, figs. 1a - d, 2a - b; pl. 5, fig. 2a - c.

1979 *Delepinoceras eothalassoide* Wagner-Gentis — Ruan Yi-ping, p. 1.

Material — One specimen from La Lastra, showing the shape of the shell, sutures and the ornament; and one specimen from Revilla, showing sutures.

Description — The shell is an involute ellipsocone with an open, small umbilicus. The venter is strongly curved, whilst the sides are rounded to nearly flat in the mature whorls.

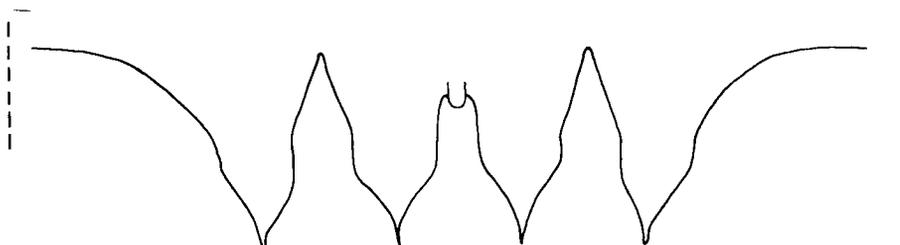


Fig. 10. *Platygoniattites eothalassoides* (Wagner-Gentis), from loc. 134, Revilla at 7.2 m above the base; RGM 298 608; suture, $\times 2$.

Both specimens have only one visible constriction which starts at the umbilical edge and crosses the lateral side, but fades on the venter. The ornament consists of strong longitudinal striae, c. 45 per half-whorl. These are crossed by very fine transverse lirae producing granules on the crossing points. The transverse lirae bend slightly forwards from the umbilical edge to one third of the lateral side, where the transverse ornament starts to deflect backwards. The very gentle backward inclination of the lirae continues until the ventro-lateral area is reached and a very deep sinus is formed on the venter.

The suture (Fig. 10) consists of a sturdy median saddle, flanked by two ventro-lateral lobes which are triangular with a long narrow point. The first lateral saddles are ogival; the lateral lobes are again triangular with a long narrow point. The two lobes are of equal width and equal depth. The saddle between the lobes is also of the same width as the lobes. The lateral lobes are followed by asymmetrical, wide and rounded saddles which end at the umbilical edge. The umbilical lobes are not visible. The internal suture as shown on the specimen from La Lastra consists of a long, narrow pointed dorsal lobe, constricted near the top. The dorsal lobe is flanked by narrow rounded saddles, which are nearly twice as wide as the lobe. They in turn are flanked by long, narrow, pointed lobes, a little shorter than the dorsal lobe. The second lateral saddles are not visible.

Dimensions (in mm)

RGM No.	— holotype (Entrago)	298 609 (La Lastra)
D	c. 40	c. 42
W	c. 11	c. 18
H	20	c. 20
h	7.5	c. 7
U	c. 5.5	c. 8

Discussion — There are slight differences between the holotype from Entrago and the specimen from La Lastra, viz. the holotype is slimmer than the specimen from La Lastra and the ventral lobe of the holotype seems to be slightly more evolved towards a trifid lobe, as in *Delepinoceras*. However, the latter characteristic is difficult to ascertain because the specimen from La Lastra is covered with shell substance showing the ornament, some of which had to be removed to see the suture line. The patch of ornament visible on the internal side of the holotype, which is visible as a counter-impression (Wagner-Gentis, 1963, pl. 5, fig. 2c), resembles closely the ornament of the La Lastra specimen. Therefore I consider it justified to regard them as specifically identical.

Comparisons — *Platygoniatites eothalassoides* is very similar to *Pl. omniliratus* Ruzhencev & Bogoslovskaya (1971, p. 216 - 217). Certainly the greater width of the La Lastra specimen is in accordance with the Russian species. It differs, though, in the possession of a larger umbilicus at similar diameter and the presence of fewer longitudinal striae.

Occurrence — In the Genicera Formation near Revilla, loc. 134, at 7 m above the base, and in the shelly limestone near La Lastra, both in the province of Palencia. The holotype is from Entrago in Asturias. Mainly associated with

Dombarites acicularis and *Stenopronorites uralensis*. In La Lastra also with *Cravenoceras leion*, indicating the extreme base of the Namurian E1 Zone.

The species is mentioned from China, Nandan in Guangxi, in a list by Ruan Yi-ping (1971, p.1).

The very similar species *Pl. omniliratus* occurs in the Dombar river valley, South Urals, in the lower Namurian Nm₁a₁ - a₂ of Ruzhencev's connotation.

Family CRAVENOCERATIDAE Ruzhencev, 1957

Subfamily CRAVENOCERATINAE Ruzhencev, 1957

Genus *Pachylyroceras* Ruzhencev & Bogoslovskaya, 1971

Pachylyroceras cf. *P. newsomi* (Smith, 1903)

Pl. 6, fig. 4; Fig. 11.

vide 1903 *Goniatites newsomi* Smith, p. 78, pl. 17, figs. 2 - 5.

vide 1964 *Neoglyphioceras newsomi* Smith — Gordon, p. 202 - 203, pl. 20, figs. 1 - 11; text-figs. 50 H, 51 D.

vide 1971 *Pachylyroceras newsomi* Smith — Ruzhencev & Bogoslovskaya, p. 244.

Material — One septate specimen.

Description — The shell is discoidal, with a rounded venter, fairly short sides and a rather large umbilicus.

No ornament is preserved.

Suture as in Fig. 11.

Dimensions — D = 21.5 mm; W = 15 mm; h = 4.5 mm; D of preceding whorl is 17 mm; W = 12 mm; H = 8 mm; h = 4 mm.

Discussion — The measurements of the specimen from Revilla are the same as those given by Gordon, who redescribed the holotype, and also the suture compares well with that of the holotype (Gordon, 1964, p. 202, fig. 51B).

Occurrence — At Revilla (loc. 134) at 5.1 m above the base of the outcrop, associated with *Goniatites granosus*, thus indicating upper Viséan (Goy, P2, or C₁v₃ Zone).

The holotype comes from the lower part of the Ruddell Shale at Batesville, Arkansas, U.S.A.

The species is also known from Germany, IIIy Zone (Schmidt, 1925), England, P2 Zone (Moore, 1936) and N. Africa, S4a Zone (Pareyn, 1961), but these occurrences are questioned by Gordon (1964).

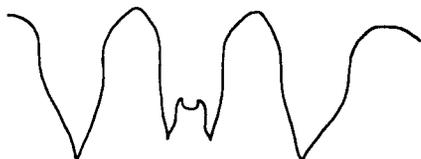


Fig. 11. *Pachylyroceras* cf. *P. newsomi* (Smith), from loc. 134, Revilla at 5.1 m above the base; RGM 298 618; suture, $\times 3$.

Pachylyroceras cf. *P. constrictum* Ruzhencev & Bogoslovskaya, 1971
Pl. 8, fig. 1.

vide 1971 *Pachylyroceras constrictum* Ruzhencev & Bogoslovskaya, p. 247, pl. 21, figs. 9 - 10; pl. 23, figs. 1 - 2.

Material — One slightly crushed specimen, showing ornament and constrictions.

Description — Shell fairly wide and evolute. Venter wide and rounded, hardly any sides, umbilical wall starting rather high up to the side and sloping gently towards the previous whorl.

Three deep constrictions are preserved, cutting deeply into the umbilical wall, sides and venter. The ornament consists of c. 12 longitudinal ribs per half-whorl.

No suture preserved and dimensions difficult to give because the shell is slightly deformed.

Remarks — The coarse longitudinal striae (ribs), the deep constrictions and the wide smooth umbilical wall invite comparison with *P. constrictum* (Ruzhencev & Bogoslovskaya, 1971, pl. 21, fig. 9b; pl. 23, fig. 1a).

Occurrence — Revilla outcrop (loc. 134), at 8.3 m above the base, together with *Dombarites acicularis*, indicating the E1 Zone of the lower Namurian.

The holotype is from the Dombar river valley, South Urals, of early Namurian age (Nm_{1a2} of Ruzhencev's connotation).

Genus *Cravenoceras* Bisat, 1928

Cravenoceras leion Bisat, 1930
Pl. 6, fig. 1.

1930 *Cravenoceras leion* Bisat, p. 28 - 32, fig. 1.

1950 *Cravenoceras leion* Bisat, p. 21 - 23, pl. 2, figs. 1, 5.

Material — One specimen half-imbedded in shelly limestone; it shows the ornament and a constriction.

Description — The shell is an involute sphaerocone with rounded venter and rounded sides. The umbilicus is not entirely free, but appears to be small.

One constriction is visible on the lateral side; it seems to fade away on the venter. The ornament consists of very fine transverse lamellae which cross the sides and venter in nearly straight lines. The constriction has a similar but slightly different course; it leans forwards, whilst the transverse ornament crosses the sides more perpendicularly from the umbilicus.

No suture has been preserved.

Dimensions — W = 9 mm; H = 4.5 mm; U = 2 mm.

Occurrence — Near La Lastra, where it occurs together with *Cravenoceras shi-*

manskyi, *Rhymmoceras gracilentum*, *Platygoniatites eothalassoides*, and *Dombarites acicularis*. These are all basal Namurian species, ranging in Ruzhencev's zonation from Nm_1a_2 to Nm_1b_2 . *Cravenoceras leion* is the primary index for basal Namurian in Northwest Europe (van Leckwijck, 1960, p. XXVI), where it is associated with a rather different assemblage to that found in the Spanish locality.

Cravenoceras shimanskyi Ruzhencev & Bogoslovskaya, 1971
Pl. 6, fig. 3a - b.

1971 *Cravenoceras shimanskyi* Ruzhencev & Bogoslovskaya, p. 257 - 258, pl. 24, figs. 2 - 4.

Material — One specimen showing shape and ornament.

Description — Cadicone shell with an extremely wide, rounded venter and hardly differentiated sides. Umbilicus large with a clearly marked umbilical edge. There is one constriction over the venter which is fairly deep. It is bordered by low, rounded ridges which are wider than the constriction. There is an extremely fine transverse ornament which is difficult to see with the naked eye. It consists of extremely fine lamellae.

No suture is visible.

Dimensions — $D = 21$ mm; $W = 20$ mm; $H = 4$ mm; $h = 4$ mm; $U = 7.5$ mm.

Discussion — The Spanish form appears a little wider than the type, but this is probably due to a limited amount of radial squashing. Its shape is similar to the specimen figured in Ruzhencev & Bogoslovskaya (1971, pl. 24, fig. 4).

Occurrence — Near La Lastra, in association with several species of the E1 Zone.

In the South Urals it occurs in lower Namurian strata, Nm_1b_1 of Ruzhencev's zonation.

Genus *Tympanoceras* Ruzhencev, 1958

Tympanoceras sp.
Fig. 12 A - B.

Material — One whorl fragment.



Fig. 12. *Tympanoceras* sp., from loc. 134, Revilla at 9 m above the base; RGM298 619; A: cross-section whorl, $\times 1$; B: suture, $\times 3$.

Description — The shell was probably serpentinocone. The venter is rounded and grades continuously into the sides, which are short. The umbilical edge is sharp and the umbilical wall straight and at a narrow angle to the side.

There are no constrictions present and the ornament is not preserved.

The suture (Fig 12 B) consists of a ventral lobe with straight sides that diverge a little; the median saddle is low and gives the ventral lobe two small pointed secondary lobes. The ventro-lateral saddles are rounded and the following lateral lobes are large and V-shaped, the latter slightly inflated on the umbilical side only. The second lateral saddles are asymmetrical, rounded and not very wide. The umbilical lobes are small and v-shaped, they are situated on the umbilical wall.

Occurrence — Near Revilla, loc. 134, at 9 m above the base, 1 m below a band with *Dombarites acicularis* and 2 m above a band with *Platygoniatices eothalasoides*, indicating the E1 Zone of the lower Namurian.

Subfamily GLAPHYRITINAE Ruzhencev & Bogosløvskaia, 1971
Genus *Syngastrioceras* Librovtich, 1938

Syngastrioceras sp. 'early form'
Pl. 7, fig. 2; Fig. 13 A - D.

Material — One whorl segment showing cross-section of whorl and the external and internal sutures.

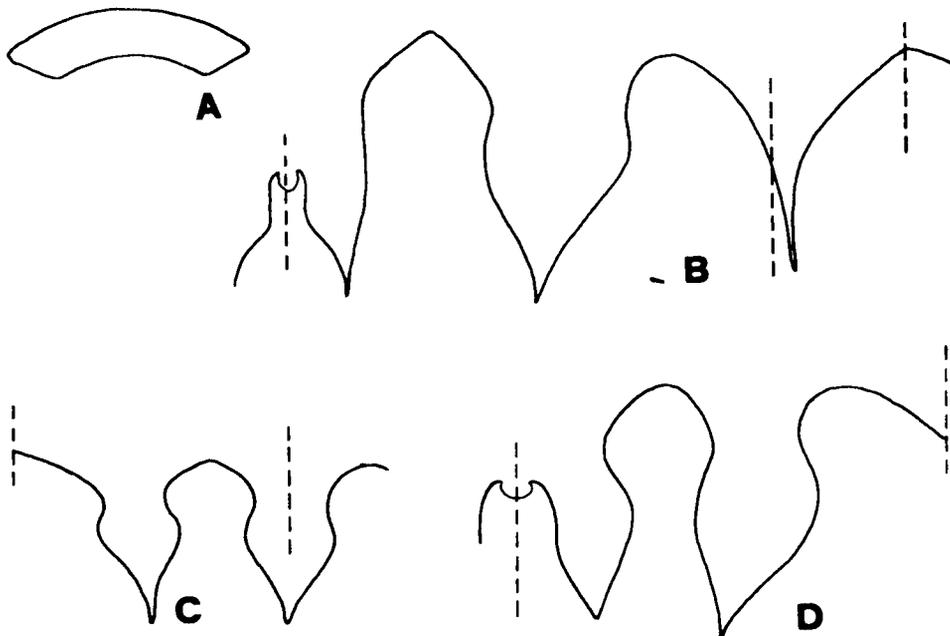


Fig. 13. *Syngastrioceras* sp. early form, from loc. 134, Revilla at 10 m above the base; RGM 298 624; A: cross-section of whorl, $\times 1$; B: external suture, $\times 3$; C: internal suture, $\times 3$. D: *Somoholites cadiconiformis* (Wagner-Gentis), from a locality 500 m S of Tolibia de Abajo (León); sketch of suture, $\times 3$.

Description — The cross-section of the whorl (Fig. 13A) indicates a serpentine to cadicone shape. The venter is wide and rounded and there is no lateral side; umbilical edge sharp and umbilical wall straight.

The suture (Fig. 13B) consists of a wide ventral lobe, with pointed secondary lobes and the sides parallel almost from the tips of the secondary lobes to where the ventral saddles commence (in *Somoholites* the sides of the ventral lobe are curved to form a constricted ventral lobe, cf. Fig. 13D). The median saddle reaches below 50% of the depth of the ventral lobe, which is lower than in the later forms (hence 'early form'). First lateral saddles triangular with blunt tips (in *Somoholites* these are much more rounded). The following lobe is constricted at its opening, has inflated sides and a long point. The second lateral saddle is asymmetrical and rounded. It ends on the umbilical wall, where a deep, narrow and sharply pointed umbilical lobe is formed. The internal suture (Fig. 13C) consists of three long, pointed and narrow lobes, somewhat constricted near the top; these are separated by two narrow rounded saddles.

Comparisons — The general outline of the suture compares well with that of the type-species *Syngastrioceras orientale* (Yin, 1935, pl. 2, fig. 1b; text-fig. 5a). However, there is a difference in the height of the median saddle which is considerably higher in *S. orientale*. *Syngastrioceras imprimis* Saunders, another early *Syngastrioceras*, has a narrower shell and the suture is different, more like *Cravenoceras* (Saunders, 1973, text-fig. 20).

Occurrence — Revilla (loc. 134), at 8.5 m above the base of the outcrop together with *Dombarites acicularis* indicating the lower Namurian E1 Zone.

Family NEOGLYPHIOCERATIDAE Plummer & Scott, 1937

Genus *Lusitanites* Ruzhencev & Bogoslovskaya, 1971

Lusitanites subcircularis (Miller, 1889)

Pl. 6, fig. 2; Fig. 14.

- 1889 *Goniatites subcircularis* Miller, p. 440. text-fig. 741.
 1925 *Glyphioceras subcirculare* Miller — Schmidt, p. 573, pl. 21, figs. 1 - 13; pl. 24, figs. 1 - 3.
 1936 *Goniatites subcircularis* Miller — Moore, p. 184 - 185, pl. 1, figs. 3 - 5, 9.
 1940 *Neoglyphioceras subcirculare* Miller — Miller & Furnish, p. 360, pl. 45. figs. 1 - 2; pl. 47, figs. 13 - 14; text-fig. 4A.
 1961 *Neoglyphioceras subcirculare* Miller — Pareyn, p. 167, pl. 20, figs. 1 - 6; text-fig. 23A - D.
 1971 *Neoglyphioceras subcirculare* Miller — Furnish, Saunders, Burdick & Strimple, p. 7, pl. 1, figs. 8 - 16.
 1971 *Lusitanites subcircularis* Miller — Ruzhencev & Bogoslovskaya, p. 323 - 325, pl. 37, figs. 1 - 4; text-figs. 83a, 84a.

Material — One partially crushed specimen showing shape, ornament and suture.

Description — Small, involute ellipsocone with a strongly rounded venter and rounded sides. Umbilicus fairly small and the umbilical wall approximately at right angles to the sides.



Fig. 14. *Lusitanites subcircularis* (Miller), from loc. 134, Revilla at 4 m above the base; RGM 298 625; suture $\times 3$.

There are four deep, strongly marked constrictions per whorl. They leave the umbilical area in a forward direction, then form a shallow and wide sinus on the lateral side and bend forwards on the latero-ventral area. It is difficult to define in which direction they cross the venter, because the other side of the specimen is crushed. However, it appears that there has been a narrow and shallow sinus crossing the venter. The ornament consists of 16 coarse longitudinal striae per half-whorl; the transverse ornament is not preserved.

The suture (Fig. 14) shows a shallow, ventral lobe, narrow at the base and wide at the top. The median saddle reaches one third of the depth of the ventral lobe. The sides of the lobe diverge in a continuous curve to form the wide, rounded ventro-lateral saddles. Lateral lobes are wide and V-shaped, with a slight inflation of the sides. The second lateral saddle is asymmetrical, low and rounded. It ends on the umbilical edge. The umbilical lobe is not visible.

Dimensions — D = 14.5 mm; W = probably 6 to 7 mm; H = c. 7.5 mm; U = 4 mm.

Occurrence — Near Revilla (loc. 134), at 4 m above the base, where it occurs with *Dombarites acicularis* early form, just below the band with *Revilloceras barruelense* indicating upper Viséan (Goy, P2, or C_{1V3}).

The species has been recorded from the U.S.A.: middle Chesterian part of the Newman Formation, Kentucky and from the Moorefield and Batesville formations, Arkansas.

In the Dombar river valley of the South Urals it occurs in the Nm_{1a1} - b₁ of Ruzhencev's zonation.

Also from the upper Viséan (P2) of Dinckley, England.

From Oelinghausen, West Germany, in the IIIy Zone.

And in North Africa from the S3c-S4a of Pareyn's zonation.

Family RHYMMOCERATIDAE Ruzhencev & Bogoslovskaya, 1971

Genus *Rhymmoceras* Ruzhencev, 1958

Rhymmoceras gracilentum Ruzhencev, 1958

Pl. 7, fig. 1.

1962 *Rhymmoceras gracilentum* Ruzhencev — Stevanović & Kullmann, p. 75 - 76, pl. 1, fig. 2.

1971 *Rhymmoceras gracilentum* Ruzhencev — Ruzhencev & Bogoslovskaya, p. 340, pl. 40, figs. 1 - 3.

1975 *Rhymmoceras gracilentum* Ruzhencev — Popov, p. 120, pl. 39, fig. 1; pl. 48, fig. 5.

Material — One small specimen, showing shape and ornament.

Description — The shell is serpenticone. Venter, sides and umbilical wall have a circular outline.

There are three deep constrictions per whorl, each accompanied by a rounded raised rim on its aboral side. They are directed backwards on the umbilical wall and continue in the same direction over the lateral sides. The first constriction of the last whorl is seen to cross the venter in a nearly straight line; the two following constrictions are not preserved on the venter. The reticulate ornament consists of c. 16 longitudinal ribs per half-whorl, crossed by transverse ribs which follow the same course as the constrictions. The reticulate pattern is developed on all parts of the whorl.

No suture is visible.

Dimensions — D = 14 mm; W = 4 mm; U = 7 mm.

Comparisons — The shells of *Rhymmoceras gracilentum* and *R. vermiculatum* are very similar. However, the Spanish specimen has the same proportions as *R. gracilentum* and its longitudinal ribs continue to be strong on the venter. *R. vermiculatum* is narrower than *R. gracilentum* and seems to have the tendency for its longitudinal striae to fade on the venter and near the umbilical edge.

Occurrence — Near La Lastra, in association with *Cravenoceras leion* and other species indicating the basal Namurian E1 Zone.

Ruzhencev records *R. gracilentum* from the South Urals in the lower Namurian Nm₁b₂ (his zonation). Popov (1975) mentions it also from the South Urals in the lower Namurian C₁n₁.

Stevanović and Kullmann (1962) record it from the E2 Zone in Serbia.

Rhymmoceras cf. *Rh. perlatum* Ruzhencev & Bogoslovskaya, 1971
Pl. 7, fig. 3.

vide 1971 *Rhymmoceras perlatum* Ruzhencev & Bogoslovskaya, p. 339, pl. 39, figs. 6 - 9.

Material — One squashed specimen, showing whorl shape as well as the ornament.

Description — The whorl is wide and flat with an extremely narrow opening. Due to the flatness of the whorl there are no sides; only venter and umbilical area.

The one constriction preserved crosses on a more or less straight line the venter and the umbilical area. The reticulate ornament consists of nearly straight to slightly wavy transverse striae, crossed by longitudinal striae on the umbilical side of the venter; on the central part of the venter the longitudinal striae are faint or non-existent.

No suture is visible.

Discussion — Although the preservation is very poor it shows the very flat venter, low opening and the virtual absence of longitudinal striae on the central part of the venter (Ruzhencev & Bogoslovskaya, 1971, pl. 39, figs. 8b, 9a).

Occurrence — Near Revilla (loc.134) at 10 m from the base of the grey nodular limestone succession, the Genicera Formation, in association with *Domba-*

rites acicularis of the lower Namurian E1 Zone.

The types are from the lower Namurian Nm₁b₂ (Ruzhencev's zonation) in the Dombar river valley of the South Urals.

Family GIRTYOCERATIDAE Wedekind, 1918

Genus *Girtyoceras*, 1918

Girtyoceras cf. *G. limatum* (Miller & Faber, 1892)

Pl. 8, fig. 2a - b; Fig. 15.

vide 1940 *Girtyoceras limatum* Miller & Faber — Miller & Furnish, p. 364 - 366, pl. 47, figs. 6 - 12; text-fig. 8b.

vide 1964 *Girtyoceras limatum* Miller & Faber — McCaleb, Quinn & Furnish, p. 15 - 17, pl. 2, figs. 1 - 3; pl. 3, fig. 7; text-fig. 6A.

Material — Half a shell, showing the shape and ornament.

Description - The shell is an involute oxycone. At a diameter of 18 mm the venter is still rounded, whilst a keel is present at a diameter of 32 mm and the shape has changed from ellipsocone to oxycone. The umbilicus is open and the umbilical wall, originally dipping towards the centre of the umbilicus, changes into being at a right angle to the side. The umbilicus also narrows proportionally with increasing size of the shell. The keel is serrated. Very faint longitudinal areas on the lateral side of the ventro-lateral area may be considered grooves, but rather appear as a flattening of the whorl outline over 2.5 mm distance at 3 mm from the keel or, when measured from the umbilical edge, at 6 mm from the edge (Fig. 15).

Three constrictions are visible on the half shell, the last one being shallower than the preceding ones. The path of the constrictions is the same as that of the ornament. The constrictions do not cut the edge of the umbilicus,

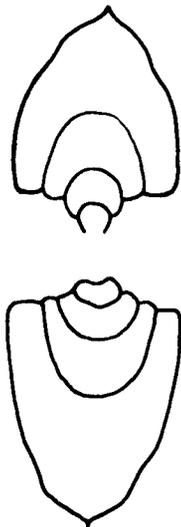


Fig. 15. *Girtyoceras* cf. *G. limatum* (Miller & Faber), from loc. 1710, Revilla; RGM 298 626; cross-section, $\times 2$.

are deepest on the lateral side, almost fade away completely at the ventro-lateral sides and are fairly deep again where they cross over the keel, forming a deep sinus. The ornament consists of fine striae forming a shallow salient near the umbilicus, and a wide sinus on the middle of the side; they then start bending rather strongly forward; when reaching the deepest part of the groove area they fade away to return on the venter as bundles forming a fairly deep sinus. These bundles of striae are perhaps instrumental in forming the serrated edge of the keel.

No suture is visible.

Dimensions (in mm)

RGM 298 626	inner whorl	outer whorl
D	18	32
W	8	13
H	7	14
h	4	8
U	7	7

Discussion — The change of the shape in successive whorls (Fig. 15) is in agreement with the description provided by various authors. The specimen also shows the serrated edge mentioned by Mc Caleb, Quinn and Furnish. There is only this single fragment and in the absence of a suture the identification must remain tentative.

Comparisons — The specimen is similar to *Girtyoceras kazakhstanicum* Ruzhen-
cev, 1966, but differs in being more slender and having a smaller umbilicus.

Occurrence — From the Genicera Formation, loc.1710, near Revilla, belonging to the upper Viséan (Goy, P2, or C_{1v3} Zone).

It is recorded from the Moorefield (Ruddell Shale) in Arkansas and Kentucky, U.S.A.

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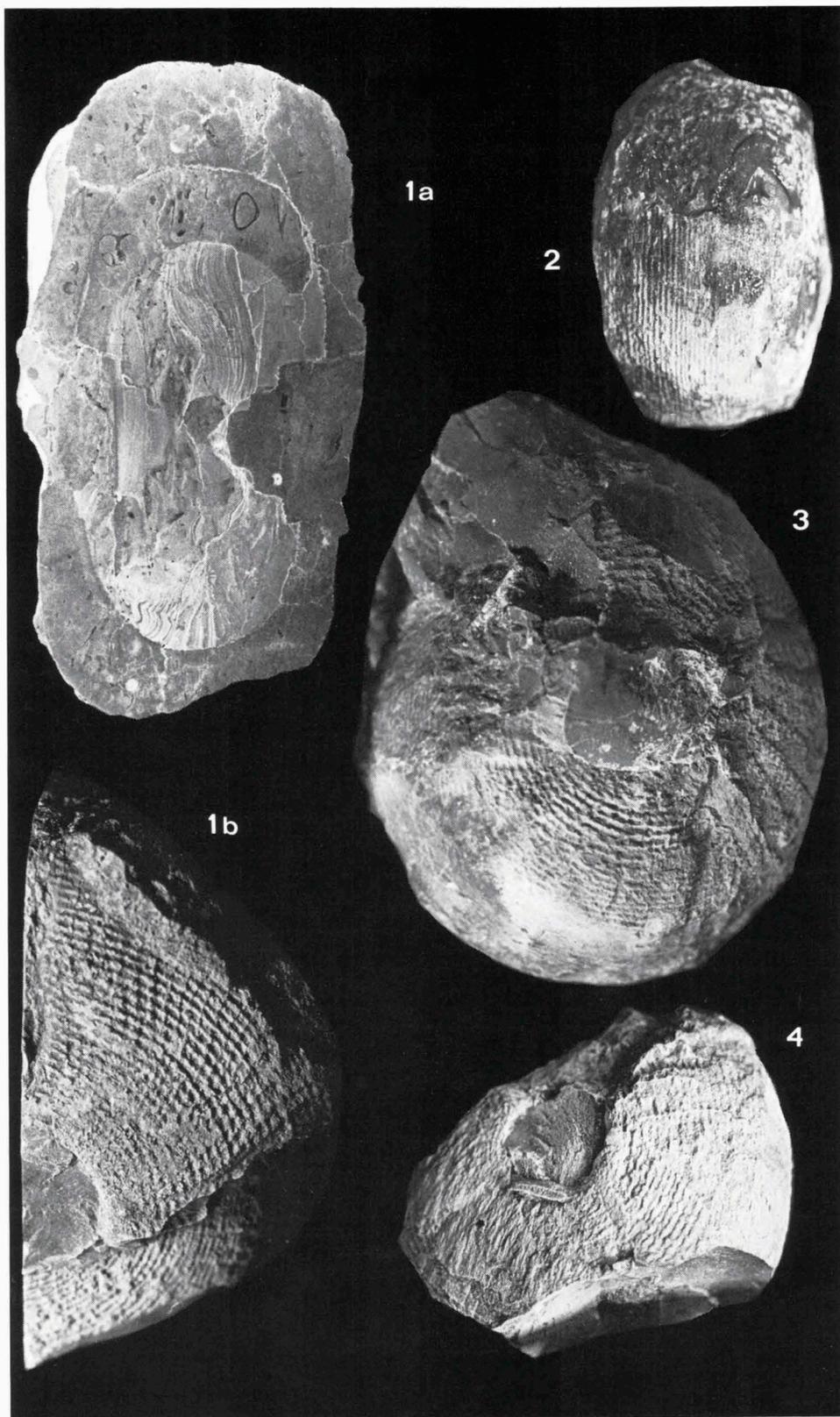
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Plate 1

- Fig. 1. *Dombarites granofalcatus* (Kullmann), from the Genicera Formation, Goy Zone, near Villabellaco, RGM 298 630;
a: cross-section, showing the rectangular shape with rounded corners of the whorls, $\times 1$;
b: lateral view, showing granofalcate ornament, $\times 1$.
- Fig. 2. *Dombarites granofalcatus* (Kullmann), from the Genicera Formation, Goy Zone, near Revilla, loc. 1711, RGM 298 601, showing ornament and traces of suture, $\times 1$.
- Fig. 3. *Dombarites granofalcatus* (Kullmann), from the Genicera Formation, Goy Zone, near Revilla, loc. 1711, stout specimen, RGM 298 602, showing the falcate ornament, $\times 1$.
- Fig. 4. *Dombarites granofalcatus* (Kullmann), from the Genicera Formation, Goy Zone, near Revilla, loc. 134 at 4.5 m above the base, RGM 298 603, lateral view, showing ornament and the fairly large umbilicus, $\times 3$.

Plate 1



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Manuscript received 23 October 1980.

Plate 2

- Fig. 1. *Goniatites granosus* Portlock, from the Genicera Formation, Goy Zone, near Revilla, loc. 134 at 5.1 m above the base, RGM 298 604, ventro-lateral view, showing ornament and part of sutures, $\times 3$.
- Fig. 2. *Neogoniatites* aff. *N. milleri milleri* Ruzhencev & Bogoslovskaya, from the Genicera Formation, Goy Zone, near Revilla, loc. 1711, RGM 298 605;
a: part of ventro-lateral ornament, $\times 3$;
b: lateral view of specimen, $\times 1$;
c: sutures, $\times 3$.
- Fig. 3. *Hypergoniatites reticulatus* sp. nov., paratype, from the Genicera Formation, Goy Zone, near Revilla, loc. 1711, RGM 298 606, ventro-lateral view, showing ornament, $\times 3$.
- Fig. 4. *Hypergoniatites reticulatus* sp. nov., holotype, from the Genicera Formation, Goy Zone, near Revilla, loc. 1711, RGM 298 607, ventro-lateral view, showing sutures, $\times 3$.

Plate 2



Plate 3

- Fig. 1. *Platygoniatites eothalassoides* (Wagner-Gentis), from the shelly limestone near La Lastra, E1 Zone, RGM 298 609;
a: ventro-lateral view, showing ornament and part of internal and external sutures, $\times 3$;
b: lateral view, showing ornament, $\times 3$.
- Fig. 2. *Platygoniatites eothalassoides* (Wagner-Gentis), from the Genicera Formation, E1 Zone, near Revilla, loc. 134 at 7.0 m above the base, RGM 298 608, lateral view, showing sutures, $\times 3$.
- Fig. 3. *Dombarites acicularis* (Pareyn), from the shelly limestone near La Lastra, E1 Zone, RGM 298 611, ventro-lateral view, showing reticulate ornamentation which occurs only on part of the whorl, $\times 3$.

Plate 3

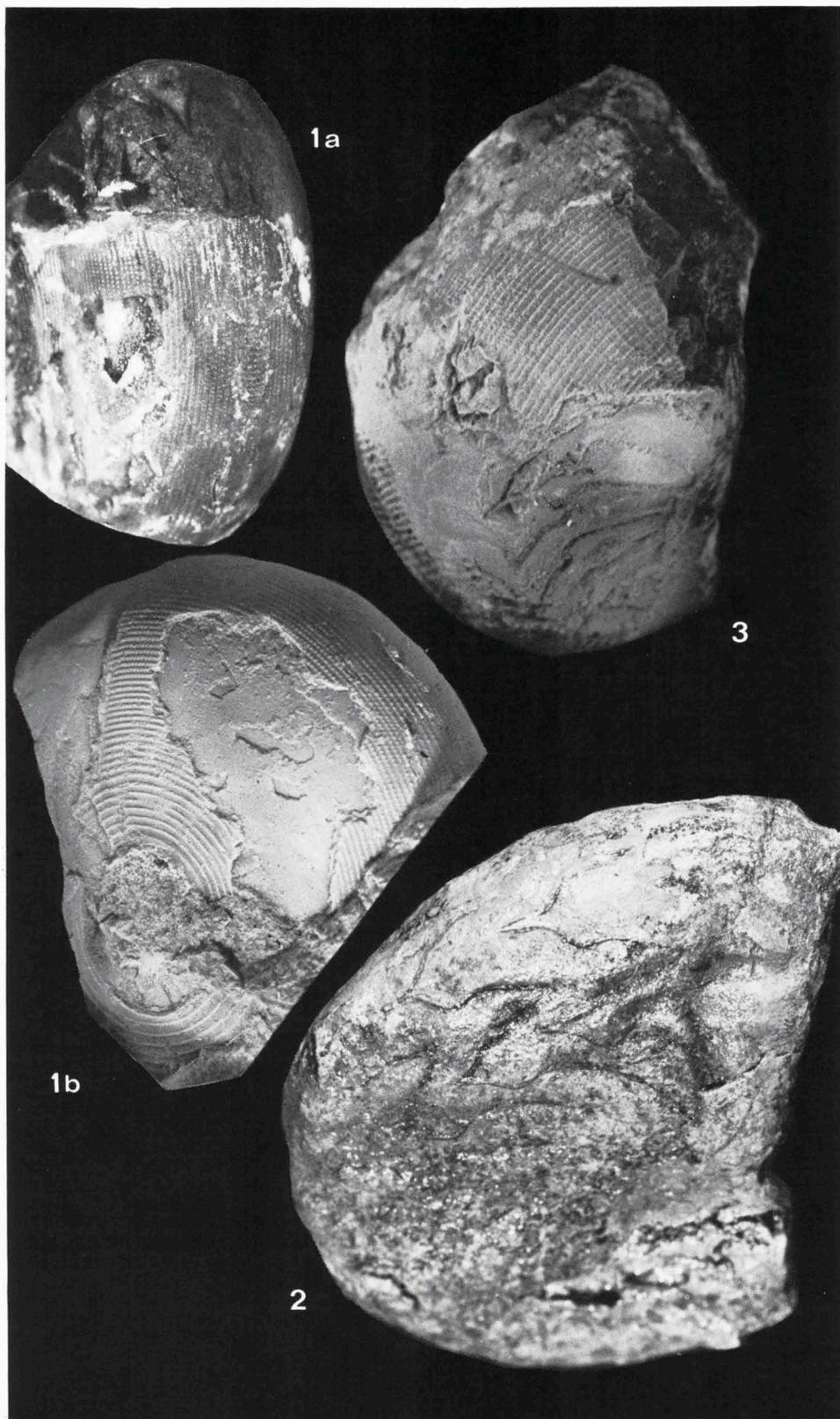


Plate 4

- Fig. 1. *Dombarites acicularis* (Pareyn), from the shelly limestone near La Lastra, E1 Zone, RGM 298 614, lateral view, showing ornament, $\times 3$.
- Fig. 2. *Dombarites acicularis* (Pareyn), from the Genicera Formation, E1 Zone, near Revilla, loc. 134 at 10 m above the base, RGM 298 610, ventro-lateral view, showing sutures, $\times 3$.
- Fig. 3. *Dombarites acicularis* (Pareyn), from the Genicera Formation, E1 Zone, near Revilla, loc. 134 at 8.0 m above the base, RGM 298 612, ventro-lateral view, showing part of the sutures and some ornamentation, $\times 3$.
- Fig. 4. *Dombarites acicularis* early form, from the Genicera Formation, Goy Zone, near Revilla, loc. 134 at 5 m above the base, RGM 298 613, ventral view, showing sutures with low median saddle, $\times 3$.
- Fig. 5. *Dombarites cantina* sp. nov., holotype, from the Genicera Formation, Goy Zone, loc. 1711, RGM 298 628;
a: ventral view, showing ornament and suture, $\times 1$;
b: lateral view, showing shape and ornament, $\times 1$.

Plate 4

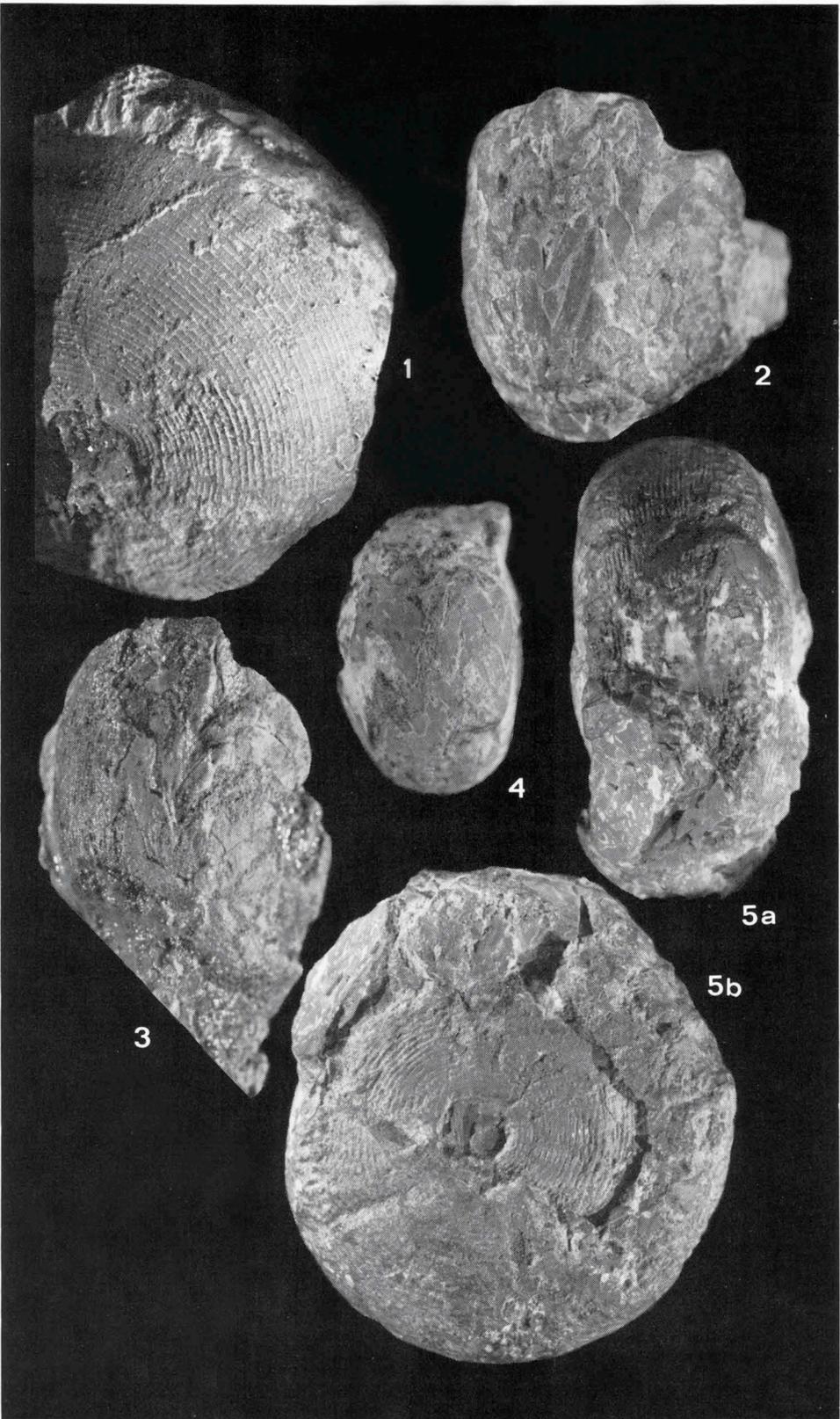


Plate 5

- Fig. 1. *Revilloceras globosum* sp. nov., holotype, from the Genicera Formation, Goy Zone, near Villabellaco, loc. 1401 at 7 m above the base, RGM 298 617, ventro-lateral view, showing sutures, $\times 3$.
- Fig. 2. *Revilloceras barruelense* (Wagner-Gentis), topotype, from the Genicera Formation, Goy Zone, near Revilla, loc. 1711, RGM 298 615, lateral view, showing shape and ornament, $\times 3$.
- Fig. 3. *Revilloceras barruelense* (Wagner-Gentis), from the Genicera Formation, Goy Zone, near Revilla at 4.5 m above the base, RGM 298 616, ventral view, showing part of suture, $\times 3$.

Plate 5

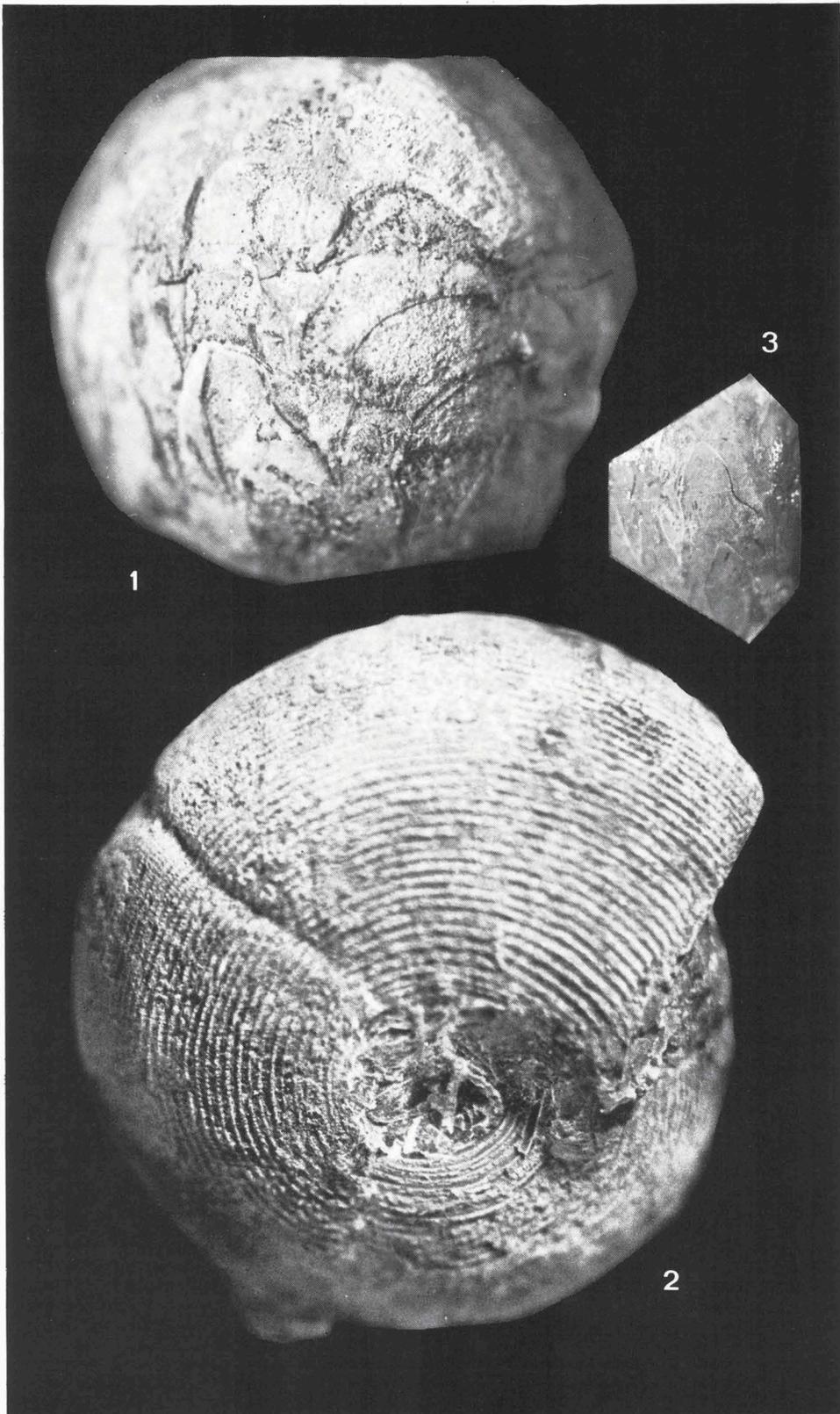


Plate 6

- Fig. 1. *Cravenoceras leion* Bisat, from shelly limestone near La Lastra, E1 Zone, RGM 298 620, specimen showing ornamentation, $\times 6$.
- Fig. 2. *Lusitanites subcircularis* (Miller), from the Genicera Formation, Goy Zone, near Revilla, loc. 134 at 4 m above the base, RGM 298 625, lateral view, showing ornament, $\times 3$.
- Fig. 3. *Cravenoceras shimanskyi* Ruzhencev & Bogoslovskaya, from the shelly limestone near La Lastra, E1 Zone, RGM 298 621;
a: ventro-lateral view, showing shape, $\times 3$;
b: part of ornament on the venter, $\times 13$.
- Fig. 4. *Pachylyroceras* cf. *P. newsomi* (Smith), from the Genicera Formation, Goy Zone, near Revilla, loc. 134 at 5.1 m above the base, RGM 298 618, showing sutures, $\times 3$.

Plate 6

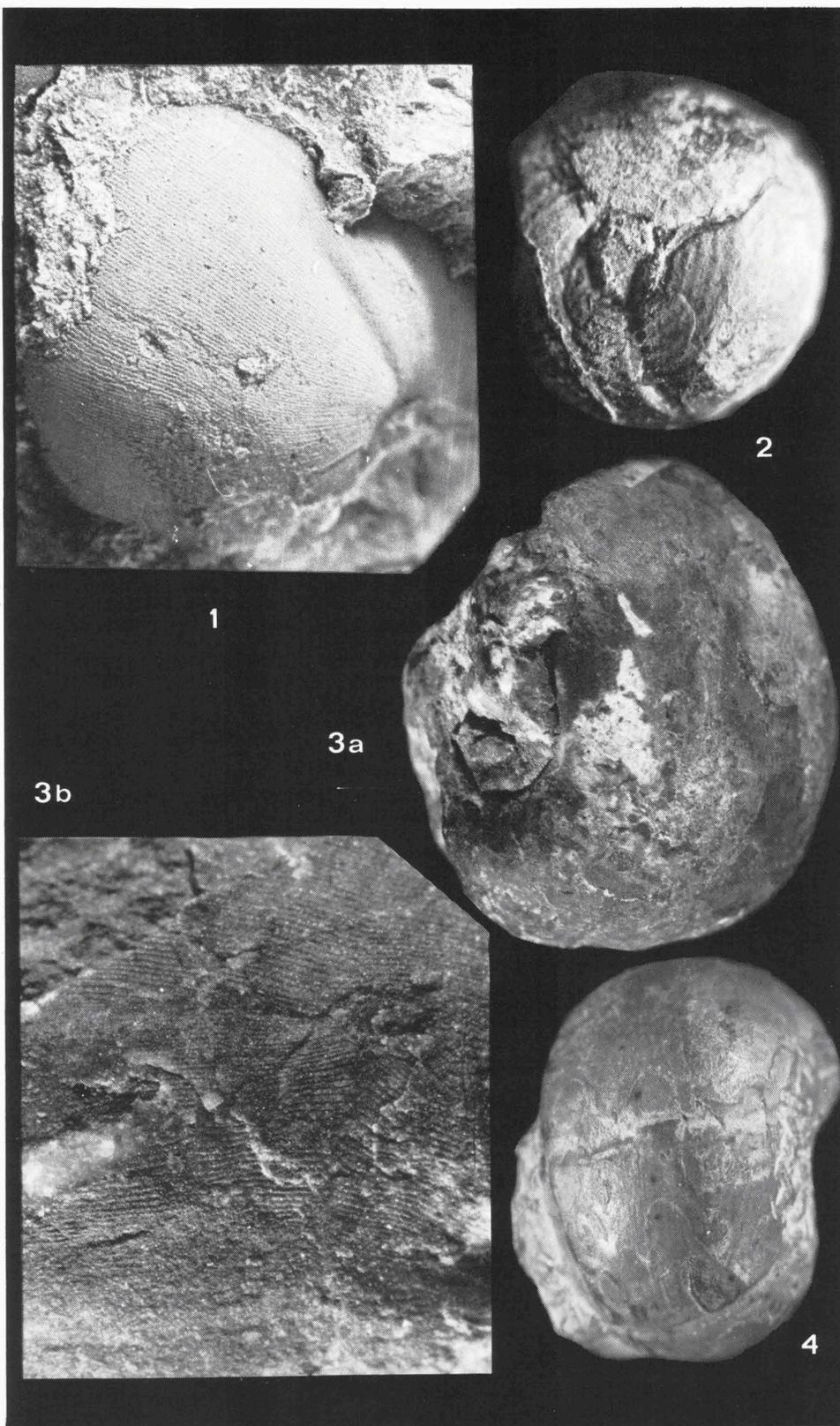


Plate 7

- Fig. 1. *Rhymmoceras gracilentum* Ruzhencev, from the shelly limestone near La Lastra, E1 Zone, RGM 298 622, lateral view, showing shape and ornament, $\times 6$.
- Fig. 2. *Syngastrioceras* sp., from the Genicera Formation, E1 Zone, near Revilla, loc. 134 at 8.5 m above the base, RGM 298 624, ventral view, showing sutures with low median saddle, $\times 3$.
- Fig. 3. *Rhymmoceras* cf. *Rh. perlatum* Ruzhencev & Bogoslovskaya, from the Genicera Formation, E1 Zone, near Revilla, loc. 134 at 10 m above the base, RGM 298 623, ventral view, showing the ornament and the very low opening, $\times 3$.

Plate 7

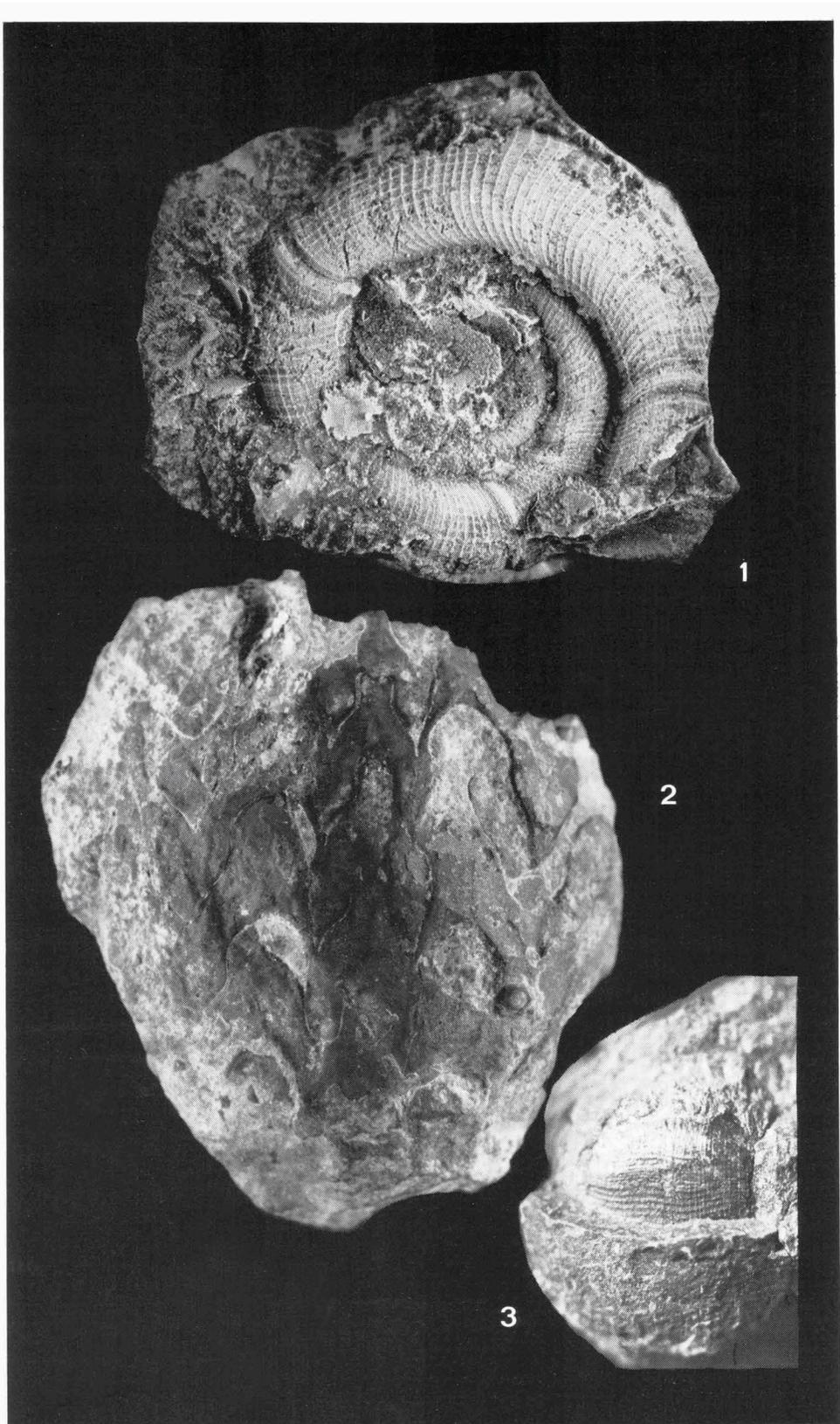


Plate 8

Fig. 1. *Pachyloceras* cf. *P. constrictum* Ruzhencev & Bogoslovskaya, from the Genicera Formation, E1 Zone, near Revilla, loc. 134 at 8.3 m above the base, RGM 298 627, ventro-lateral view, showing shape and ornament, $\times 3$.

Fig. 2. *Girtyoceras* cf. *G. limatum* (Miller & Faber), from the Genicera Formation, E1 Zone, near Revilla, loc. 1710, RGM 298 626;
a: ventro-lateral view, showing keel and ornament, $\times 3$;
b: lateral view, showing ornament, $\times 3$.

Plate 8

