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## Genus *Mathoceras* (Ammonoidea) from the Upper Aptian in the Serranía del Interior, eastern Venezuela

By OTTO RENZ<sup>1)</sup>

### ABSTRACT

The ammonite genus *Mathoceras* was so far known from a single species (*M. matho*) described by PERVINQUIÈRE (1907) from the Upper Aptian of Tunisia. During 1958-60 Guillaume collected additional material of *Mathoceras* from the Valle Grande Formation in the Serranía del Interior in eastern Venezuela. Four new species can be distinguished which form part of a rich assemblage consisting of the genera *Dufrenoyia*, *Aconeceras*, *Colombiceras*, *Gargasiceras* and others, indicating the *martinioides* Zone of the Upper Aptian.

### ZUSAMMENFASSUNG

Die Ammonitengattung *Mathoceras* war bis jetzt nur durch eine einzige Art (*M. matho*) vertreten, die von PERVINQUIÈRE (1907) aus dem oberen Aptian von Tunesien beschrieben wurde. Während 1958-1960 sammelte Guillaume weiteres Material dieser Gattung aus der Valle-Grande-Formation in der Serranía del Interior in Ost-Venezuela. Vier neue Arten können unterschieden werden, die von einer reichen Ammonitenfauna begleitet werden, bestehend aus den Gattungen *Dufrenoyia*, *Aconeceras*, *Colombiceras*, *Gargasiceras* und anderen, welche auf die *martinioides*-Zone des oberen Aptian weisen.

### Introduction

From Tunisia a small ammonite, Upper Aptian (Clansayesian) in age, has been described by PERVINQUIÈRE (1907) under the name *Hoplites* (*Kilianella*?) *Matho* (p. 18, Pl. 7, Fig. 29a, b, juvenile stage; Fig. 31a, b, type species). BREISTROFFER (1947, p. 19) tentatively referred this ammonite to the genus *Dufrenoyia*. When studying *Dufrenoyia* for his monograph on the Ammonoidea of the Lower Greensand in Britain, CASEY (1964, p. 289) established the genus *Mathoceras* for this specimen from Tunisia (Fig. 2).

A considerable number of fossils were collected by Guillaume during 1958-60, when surveying stratigraphic sections of the Lower Cretaceous exposed in the Serranía del Interior for Compañía Shell de Venezuela. The cephalopods were sent to the British Museum where they have been determined by C. W. Wright. Several ammonites, considered by Wright to represent new genera were donated to the British Museum (specimens BM.C68185-89, GUILLAUME, BOLLI & BECKMANN

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1972, p. 1653). CASEY (1964, p. 289) saw those ammonites and recognized their similarity with *Mathoceras* from Tunisia.

Recently a limestone boulder with ammonites, collected by H. Kugler from the Upper Eocene Plaisance Conglomerate in Trinidad, was examined by the writer. Some of the ammonites extracted show a close resemblance to *Mathoceras* CASEY. We therefore requested the curator of the British Museum to lend the material from Venezuela for comparison and study.

### Stratigraphic introduction

The stratigraphic investigations by Guillaume in the Serranía del Interior were restricted to the Sucre Group equivalent to the Lower Cretaceous (Léxico Estratigráfico de Venezuela 1970, p. 575). Of special interest was the lateral transition of the clastic, partly deltaic facies in the south into successively more marine formations to the north. The southern facies is referred to as Barranquín Formation (LIDDLE 1928, p. 108), considered to be about Barremian to Aptian in age. It consists predominantly of quartz sands the origin of which is the Guayana Shield. These sandstones alternate with neritic limestones and black, carbonaceous shales containing abundant plant remains.

To the north parts of the lower Barranquín grades laterally into the Taguarumo Formation (VON DER OSTEN 1954) the age of which is assumed to be predominantly Lower Aptian (GUILLAUME, BOLLI & BECKMANN 1972, Fig. 1). Characteristic for

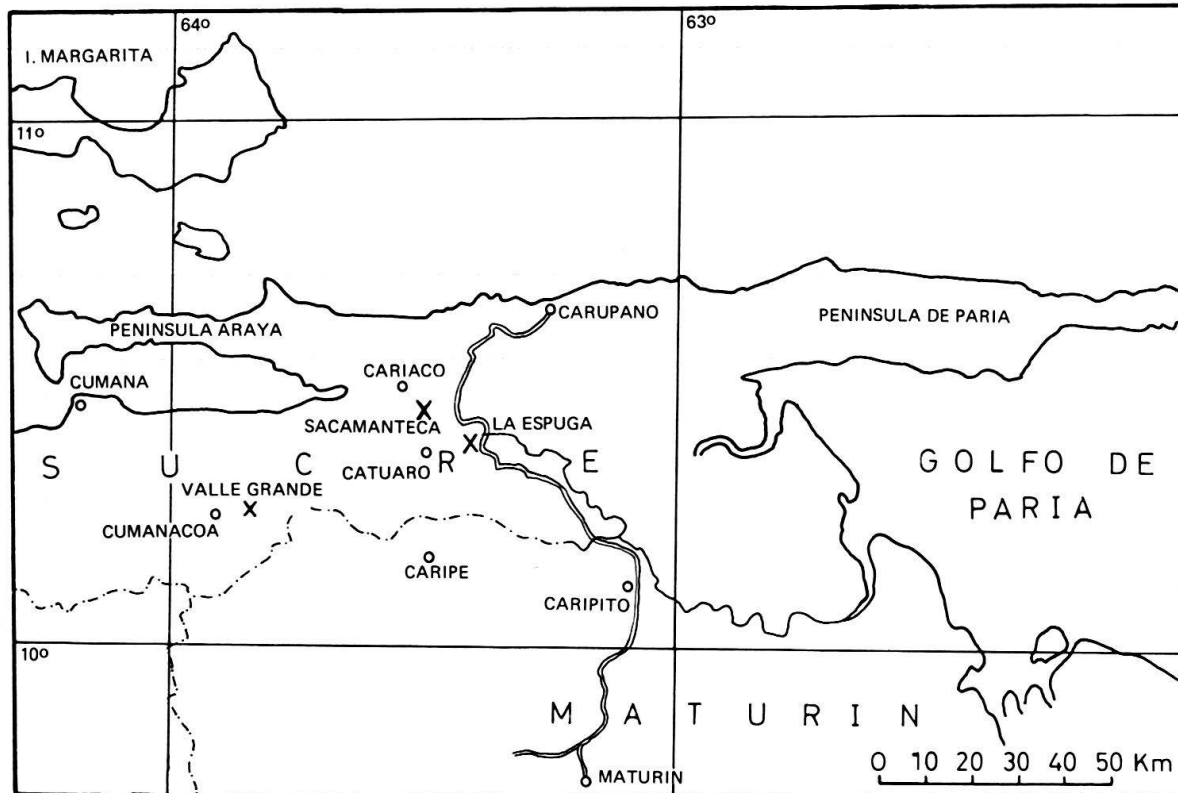


Fig. 1. Map showing distribution of the genus *Mathoceras* in the Valle Grande Formation of the Serranía del Interior.

this interval are limestones and marls rich in *Choffatella decipiens* SCHLUMBERGER. In the south the Barranquín is followed by a conspicuous shale body, which farther north overlaps on the Taguarumo. This shale interval was originally included within the El Cantil Formation (LIDDLE 1928, p. 124) consisting predominantly of massive, neritic limestones Aptian to Albian in age. It has been separated from the latter by GUILLAUME, BOLLI & BECKMANN (1972, p. 1628), and named Garcia Formation. The thickness of this interval increases considerably from south to north, reaching 150 m on Picuda Grande Island. The Garcia Shale is famous for its abundance of ammonite assemblages indicating mostly Upper Aptian. The *martinioides* Zone (CASEY 1961, p. 497) below and the *subnodosocostatum* Zone above can be distinguished. The Garcia Shale grades laterally into the lower part of the Valle Grande Formation established by ROD & MAYNC (1954, p. 239). This interval comprises the Upper Aptian as well as time equivalents of the Lower Chimana Formation (HEDBERG & PYRE 1944, p. 8) of Lower and Middle Albian age, containing ammonite faunas which indicate the *mammillatum* Zone below and the *dentatus* Zone above. In the *Léxico Estratigráfico* (1970, p. 615) the name Valle Grande, according to SALVADOR (1964), has been declared invalid because of its lithological similarities with the Chimana, into which it has been incorporated. The Chimana was thus extended locally into the Upper Aptian. GUILLAUME, BOLLI & BECKMANN (1972, p. 1620) did not follow this suggestion and continued to use the term Valle Grande, what – in the writer's opinion – is correct at the present state of knowledge. The regional extension of the Garcia and Valle Grande reaches from Barcelona in the west, eastwards as far as the Caño Gariquén. Its southern boundary follows about the watershed of the Serranía del Interior.

### Occurrence and preservation

Representatives of the genus *Mathoceras* were found by Guillaume at three localities, all situated in the Estado Sucre (Fig. 1).

1. Two specimens derive from the type section of the Valle Grande Formation in the Cumanacoa region, about 5 km east of the town (GUILLAUME, BOLLI & BECKMANN 1972, Fig. 2, 5, 9).

2. Two specimens were collected near the houses Sacamanteca along the trail connecting the town Cariaco with the village Catuaro, 11 km to the south (GUILLAUME, BOLLI & BECKMANN 1972, Fig. 2, 6).

3. One specimen comes from the río La Espuga Valley, along the road Carupano–Caripito, just south of the bridge over the river (GUILLAUME, BOLLI & BECKMANN 1972, Fig. 6).

*Mathoceras* derives from shales within the transition zone from the Garcia into the Valle Grande Formation. All specimens consist of limonite. Occasionally parts of the tests are preserved as a thin layer of limonite. Aragonite thus seems to have been replaced by pyrite which oxydized to limonite.

The pelagic foraminiferal fauna, determined by BOLLI & BECKMANN (GUILLAUME, BOLLI & BECKMANN 1972, p. 1641) indicates the *Biglobigerinella barri* Zone of about Upper Aptian in age.

## Systematic descriptions

### Family *Deshayesitidae* STOYANOW 1949

The *Deshayesitidae* are subdivided by CASEY (1963, p. 289) in two subfamilies: the *Deshayesitinae* and *Mathoceratinae*. The former include *Burckhardtites* HUMPHREY 1949, *Prodeshayesites* CASEY 1961, *Kuntziella* COLLIGNON (1962, p. 64, Fig. 1032–1035) and *Neodeshayesites* CASEY (1963, p. 289).

### Subfamily *Mathoceratinae* CASEY 1963

This taxon includes, according to CASEY, the genera *Cloioceras* WHITEHOUSE (1927, p. 118; type species: *Hoplites ruspolii* MAYER-EYMAR [1893, p. 258, Pl. 2, Fig. 10, 11] from Somalia) and *Somalites* TAVANI (1949, p. 47, Fig. 6–9).

### Genus *Mathoceras* CASEY 1964

*Type species: Hoplites (Kilianella?) Matho* PERVINQUIÈRE 1907, p. 185, Pl. 7, Fig. 31a, b, Upper Aptian.

A description of the type species from Tunisia, based on PERVINQUIÈRE 1907 is given.

### *Mathoceras matho* (PERVINQUIÈRE)

Fig. 2 a–c

1907 *Hoplites (Kilianella?) Matho* PERVINQUIÈRE, holotype, p. 185, Pl. 7, Fig. 31a, b.

1947 *Dufrenoyia? matho* PERVINQUIÈRE, BREISTROFFER, p. 35.

1963 *Mathoceras matho* (PERVINQUIÈRE), CASEY, p. 289, 377.

*Description of holotype.* – Initial smooth stage up to about 6 mm diameter. Whorl section of adult stage rectangular, slightly higher than wide. Venter trapezoidal, concave between two opposing rows of clavi. Sides faintly convex. Umbilicus about one third diameter. Umbilical wall vertical, umbilical margin rounded. Ribs flexuous inclining forward on ventral third of flank. At 12 mm diameter some secondary ribs, not reaching umbilical margin, appear. Later all ribs part from low conical tubercles on umbilical margin. Simultaneously ventrolateral tubercles as well as outstanding ventral clavi on ventral termination of ribs develop.

*Measurements* (based on Fig. 31a, b in PERVINQUIÈRE 1907). – Dm: 19 mm, Ww: 5 (0.29), Wh: 8 (0.41), U: 6.5 (0.34).

*Remarks.* – The holotype of *M. matho* has been collected by Aubert from the Upper Aptian (Clansayésien) between Bèjà-gare and l'Ouad Zerga in Tunisia.



Fig. 2. a, b = *Mathoceras matho* (PERVINQUIÈRE), copy of holotype from Tunisia, PERVINQUIÈRE (1907, p. 185, Pl. 7, Fig. 31a, b). 1:1. c = Suture line after PERVINQUIÈRE (1907, p. 185, textfig. 72, taken from juvenile specimen Pl. 7, Fig. 30). 6.4×.

*Mathoceras venezolanum* n. sp.

Fig. 3 a-b, 1, 4a

*Holotype.* – Gu 1237, deposited in British Museum, BM.C 68185.

*Locus typicus.* – Type section of Valle Grande Formation, Serranía del Interior, eastern Venezuela (Estado Sucre).

*Age.* – Upper Aptian, *martinioides* Zone.

*Description of holotype.* – About one-fourth of outer whorl belongs to body chamber (arrow). Whorl smooth on initial stage to about 4.5 mm diameter and whorl section oval. Later turning subquadrate, thickest on ventrolateral tubercles. Flanks parallel, slightly convex between ribs. Venter subtabulate, between opposing external clavi broadly concave. Umbilicus 30% of diameter. Umbilical wall falls steep on ventrolateral clavi on preceding volution, and rounds gently into flank, without forming an umbilical edge. Costation distant, about 19 ribs on outer whorl from which eight, at about equidistant intervals are stronger primaries provided with prominent ventrolateral tubercles. Towards body chamber primaries are slightly raised into umbilical bullae. Intermediate secondaries, beginning on umbilical margin, are weak, inconstant in strength, and some are faintly elevated on ventrolateral shoulder. All ribs are straight between umbilicus and ventrolateral shoulder, and on outer third of flank turn distinctly forward towards the venter, broadening and flattening, and ending in prominent ventral clavi, obliquely projected forward. Few secondary ribs are only slightly elevated on venter. Suture (Fig. 31) as on *Dufrenoyia* (SCHINDEWOLF 1966, p. 688).

*Measurements.* – Gu 1237, BM.C 68185 (end phrag.): Dm: 17.5, Ww: 7 (0.40), Wh: 7.4 (0.42), U: 5 (0.30).

*Remarks.* – The holotype has been collected in the Valle Grande Formation within a dark grey, arenaceous shale interbedded in calcareous glauconitic shale, about 8 m above the upper limit of the Taguarumo Formation which here is still Upper Aptian in age and bearing *Dufrenoyia*. *M. venezolanum* occurs associated with *Aconeceras nisus* (D'ORBIGNY). Some 30 m higher in the section, Guillaume collected a rich assemblage composed of the genera *Aconeceras*, *Melchiorites*, *Zuercherella*, *Dufrenoyia*, *Colombiceras* and *Gargasiceras*.

Paratype of *Mathoceras venezolanum* n. sp. (Fig. 3 i-k, 4b)

Gu 1609, BM.C 68189. A chambered fragment of *M. venezolanum* has been collected some 40 km farther east, along the road Carupano–Caripito south of the bridge over the río Espuga. It derives from an interval, 25 m thick, of calcareous shale about time-equivalent with that exposed above the Taguarumo at the base of the Valle Grande near the houses of Sacamanteca. The accompanying ammonite assemblage, collected by Guillaume and determined by Wright, consists of:

*Aconeceras nisus* (D'ORBIGNY)

*Sanmartinoceras haugi* (SARASIN)

*Valdedorsella getulina* (COQUAND)

*Acanthoplites* cf. *aschiltaensis* (ANTHULA)

*Colombiceras* sp.

*Gargasiceras* aff. *acuticostatum* (RIEDEL)

*Zuercherella zuercheri* (JACOB)

*Mathoceras sucre* n. sp.

Fig. 3 e-f, 4e

*Holotype*. – Gu 1238, deposited in British Museum, BM.C 68186.

*Locus typicus*. – Type section of Valle Grande Formation, Serranía del Interior, eastern Venezuela (Estado Sucre).

*Derivatio nominis*. – Estado Sucre.

*Age*. – Upper Aptian, *martinioides* Zone.

*Description of holotype*. – Begin of body chamber uncertain (indicated by a line). Juvenile volutions, up to 7 mm diameter, smooth, oval, venter rounded. Later whorl section gradually turning rectangular simultaneous with strengthening of ventral clavi. Flanks parallel, slightly convex. Venter flat, tabulate, concave between external clavi. Siphon partly broken out. Umbilicus shallow, about one third of diameter. Umbilical wall low, falling on mid-flank of preceding volution; umbilical margin rounded. Costation weak, inconstant, beginning at a diameter of about 7 mm. Ribs very low, sigmoidally curved, parting from umbilical margin where faint indications of umbilical bullae are recognizable on body chamber only (better visible on opposite side). Eight about equidistant ventrolateral bullae, different in strength are developed. From there ribs turn slightly adorally ending in 20 prominent ventral clavi obliquely turning forward and different in height according to strength of ribs. Faint looping of ribs between ventrolateral bullae and ventral clavi occasionally occurs (right side on Fig. 3e).

*Measurements*. – Gu 1238, BM.C 68186: Dm: 15.5, Ww: 5.4 (0.34), Wh: 7 (0.46), U: 5 (0.32).

*Remarks*. – The holotype has been collected at the base of the Valle Grande Formation within the same shale interval as *M. venezolanum*.

*Mathoceras caribense* n. sp.

Fig. 3 g-h, m, 4d

*Holotype*. – Gu 1570, deposited in the British Museum, BM.C 68188.

*Locus typicus*. – Base of Valle Grande Formation, near houses Sacamanteca, south-southeast of Cariaco, Serranía del Interior (Estado Sucre).

*Age*. – Upper Aptian, *martinioides* Zone.

*Description of holotype*. – Diameter of phragmocon 10 mm (arrow). Inner volutions, up to about 5 mm diameter without sculpture, whorl section oval, venter broadly rounded. As growth proceeds whorl section more compressed, turning gradually subrectangular. Sides feebly convex between ribs, thickest below mid-flank. Venter about tabulate, flatly concave between peripheral clavi. Umbilicus one third of diameter. Umbilical wall rounding into flank and falling on preceding volution slightly above mid-flank. Costation begins at 8 mm diameter. Eight distant, prorsiradiate primary ribs, swelling on body chamber into low umbilical bullae, and

gradually losing strength toward the outer third of flank where they raise in low, bullae-like tubercles from which they curve forward, ending in prominent ventral clavi. Faint looping of ribs occurs between ventrolateral tubercles and peripheral clavi.

*Measurements.* – Gu 1570, BM.C 68188: Dm: 12.3, Ww: 4 (0.33), Wh: 5 (0.40), U: 4 (0.33).

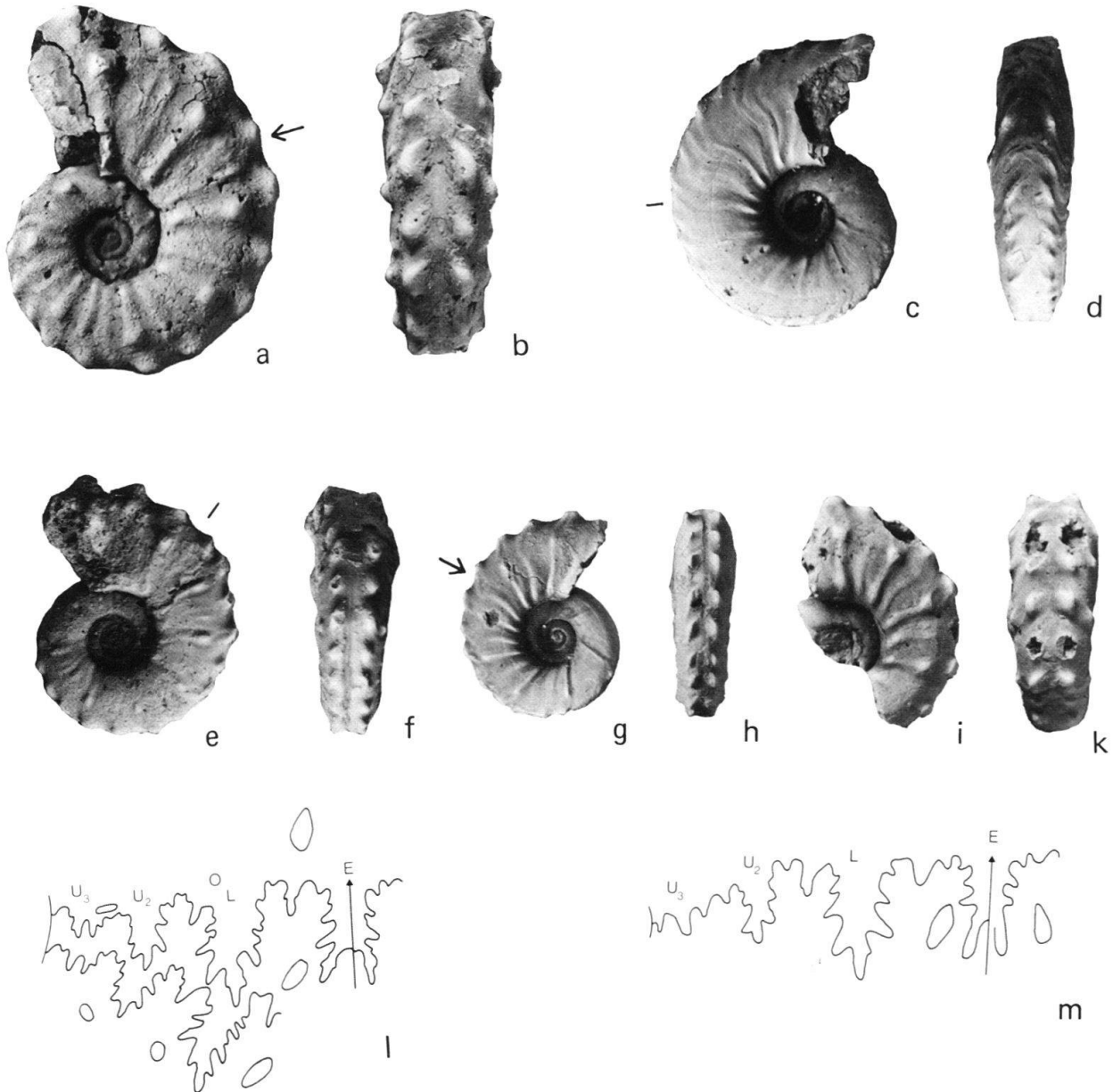


Fig. 3. a, b = *Mathoceras venezolanum* n. sp., holotype, Gu 1237, BM.C 68185, type section Valle Grande Formation, about 6 km east of Cumanacoa. 2×. c, d = *Mathoceras laeve* n. sp., holotype, Gu 1569, BM.C 68187, houses Sacamanteca along trail Cariaco-Catuaro. 2×. e, f = *Mathoceras sucre* n. sp., holotype, Gu 1238, BM.C 68186, type section Valle Grande Formation, about 6 km east of Cumanacoa. 2×. g, h = *Mathoceras caribense* n. sp., holotype, Gu 1570, BM.C 68188, houses Sacamanteca along trail Cariaco-Catuaro. 2×. i, k = *Mathoceras venezolanum* n. sp., Gu 1609, BM.C 68189, rio Espuga along road Carupano-Caripito. 2×. l = Suture of *Mathoceras venezolanum* n. sp., holotype. 4×. m = Suture of *Mathoceras caribense* n. sp., holotype. 8×.

*Remarks.* – *Mathoceras caribense* was collected from a calcareous shale interval, about 25 m thick, which overlays the Taguarumo Formation. It forms part of a rich ammonite assemblage consisting of:

<i>Aconeceras nesus</i> (D'ORBIGNY)	<i>Gargasiceras</i> sp.
<i>Sanmartinoceras haugi</i> (SARASIN)	<i>Dufrenoyia justinae</i> HILL
<i>Zuercherella zuercheri</i> (JACOB)	<i>Dufrenoyia justinae sanctorum</i> BÜRGL
<i>Valdedorsella</i> cf. <i>angladei</i> (SAYN)	<i>Ptychoceras laeve</i> MATHERON
<i>Colombiceras</i> sp.	<i>Mathoceras laeve</i> n. sp.

*Mathoceras laeve* n. sp.

Fig. 3 c-d, 4c

*Holotype.* – Gu 1569, deposited in British Museum, BM.C 68187.

*Locus typicus.* – Base of Valle Grande Formation, near houses Sacamanteca, south-southeast of Cariaco, Serranía del Interior (Estado Sucre).

*Age.* – Upper Aptian, *martinioides* Zone.

*Description of holotype.* – Conch partly covered by thin, iron stained layer, possibly representing test, diagenetically altered. Beginning of body chamber uncertain (assumed position indicated by line). Whorl section on early stage oval, widest near mid-flank; on outer whorl section rectangular, flat-sided, widest below mid-flank. Venter tabulate, between opposing clavi concave. Umbilicus about 30% of diameter, shallow and low, slightly egrading towards end. Umbilical wall steep, grading into rounded margin. Sculpture begins near 8 mm diameter with faint ventral elevations. Costation smooth, unstable, nearly effaced around mid-flank. Ribs distinct falcoïd, without ventrolateral elevations. Ribs part from low, elongated umbilical bullae at irregular intervals, and changing in size. From some umbilical bullae branching or incipient branching is faintly indicated, and those ribs seem to unite again at rather low, elongated ventral clavi, continuing on venter with pronounced forward obliquity.

*Measurements.* – Gu 1569, BM.C 68187: Dm: 16.1, Ww: 5.3 (0.33), Wh: 7 (0.43), U: 4.9 (0.30).

*Remarks.* – The holotype has been found together with *M. caribense*.

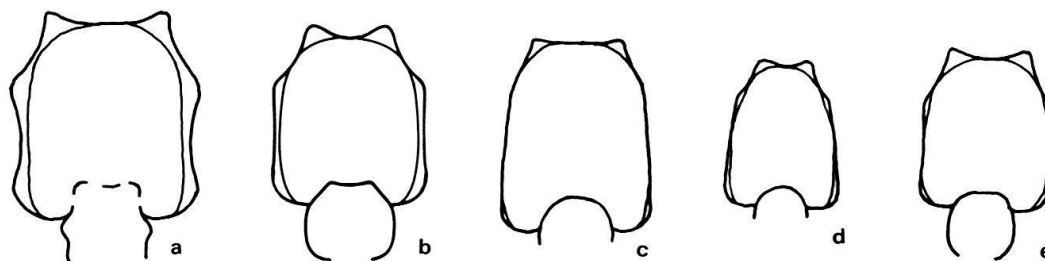


Fig. 4. Whorl sections of *Mathoceras*. a = *Mathoceras venezolanum* n. sp., holotype, end of phragmocon, Fig. 3 a-b. 3×. b = *Mathoceras venezolanum* n. sp., Fig. 3 i-k. 3×. c = *Mathoceras laeve* n. sp., holotype, body chamber, Fig. 3 c-d. 3×. d = *Mathoceras caribense* n. sp., holotype, body chamber, Fig. 3 g-h. 3×. e = *Mathoceras sucre* n. sp., holotype, about end of phragmocon, Fig. 3 e-f. 3×.

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