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LOWER CRETACEOUS AMMONITES FROM SIERRA DEL ROSARIO
(WESTERN CUBA)

Abstract.—Lower Cretaceous ammonites from the Artemisa, Polier and Lucas Formations of the Pinar del Rio province, are described. The assemblage comprises 47 species, including four new: *Karsteniceras polieri*, *Crioceras pinarensis*, *Acrioceras* (*Paraspinoceras*) *rosariensis* and ?*Pleurohoplites machini*. Some of them are common for Cuba, Mexico and south Andes. Typical west-Tethyan ammonites form a noticeable part of the Cuban assemblage.

INTRODUCTION

Lower Cretaceous ammonites from Cuba were not hitherto paleontologically studied.

The paper presents paleontological descriptions of Lower Cretaceous ammonites from Sierra del Rosario, western Cuba. They were found in the course of field works connected with preparation of the Geological Map of Pinar del Rio province, scale 1:250 000, carried out by the team of the Polish Academy of Sciences and Cuban Academy of Sciences. Tintinids (de la Torre 1972—1975, MS) and the ammonites collected made possible to establish the stratigraphy of Lower Cretaceous strata of that region and to correlate lithostratigraphic units distinguished here.

Ammonites occurring in the Lower Cretaceous strata of Sierra del Rosario are very rare and poorly preserved, usually as moulds. Nevertheless, all these finds are of a remarkable importance for the stratigraphy of the Lower Cretaceous of that region as well as of the whole western Cuba.

All specimens here described are housed in the Paleontological Museum of the Institute of Geology and Paleontology, Havana, Cuba.

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of the material and to Dr. A. de la Torre for fruitful discussions on the systematics of Cuban Lower Cretaceous ammonites. The photos of ammonites were kindly made by Mrs. E. Mulawa (Institute of Paleobiology, Polish Academy of Sciences, Warsaw).

GEOLOGICAL CHARACTERISTICS OF THE AREA OF SIERRA DEL ROSARIO

The area of Sierra del Rosario comprises eastern part of the Guaniguanico cordillera in western Cuba (see fig. 1). This region is delineated by the Pinar fault on the south, the Sierra de los Organos on the west and the Bahía Honda and La Esperanza tectonic-facies zones on the north. From the geological point of view this region consists of three sequences (Pszczółkowski 1976): southern and northern, and the Quiñones one markedly differing in facies development. The southern sequence mainly consists of terrigenous and carbonate strata of the Upper Jurassic whilst in the northern and in the Quiñones sequences the Jurassic is generally much thinner as the pre-Tithonian strata are often lacking. There are also some differences in lithology and thickness of post-Tithonian strata. The Lower Cretaceous strata of both zones yield ammonites but in small numbers and usually poorly preserved.

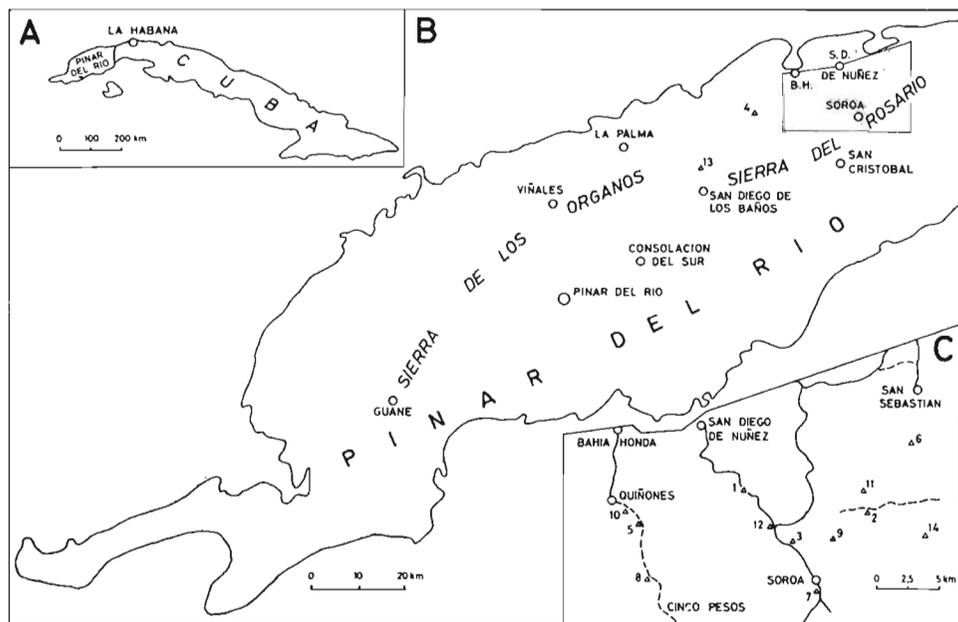


Fig. 1. Location of exposures: 1 Lomas de Polier, 2 Nortey (Casa Blanca), 3 NW of Soroa, 4 Rancho Lucas, 5 Loma Caldoso, 6 Loma del Rubi, 7 Bano, 8 Brasiliano Roble—Belén Vigoa, 9 El Herete, 10 El Aquacatillo, 11 Serafino, 12 Mago Bonito, 13 La Catalina, 14 San Miguel.

The Jurassic-Cretaceous profile of the southern part of Sierra del Rosario is currently divided into the following formations: San Cayetano (proposed by de Golyer, 1918), Francisco (by Pszczółkowski in: Kutek *et al.*, 1976) and Artemisa (by Lewis, 1932). Ammonites from the middle part of the Artemisa Fm. were studied by Imlay (1942), Judoley & Furrázola-Bermudez (1968) and recently Houša (1974a) and those from basal part of that formation as well as underlying Francisco and San Cayetano formations were described for the first time by Kutek *et al.* (1976), Myczyński (1976), Wierzbowski (1976) and Myczyński & Pszczółkowski (1976), respectively.

The ammonite-bearing strata from the northern part of Sierra del Rosario (the northern and the Quiñones sequences) are nowadays assigned to two lithostratigraphic units of the formation rank: Polier and Lucas Formations proposed by Pszczółkowski (*in*: Pszczółkowski *et al.*, 1975; Pszczółkowski, 1976). Ammonites occur in both these formations and here are described for the first time.

LITHOSTRATIGRAPHY OF AMMONITE BEARING STRATA OF SOUTHERN SIERRA DEL ROSARIO

Artemisa Formation

This formation proposed by Lewis (1932) comprises gray-blue medium-bedded limestones with gray shale intercalations. Its thickness is variable, ranging from 250 to 700 m (see Pszczółkowski in: Pszczółkowski *et al.*, 1975). Ammonites recently found in the lowermost part of that formation by Wierzbowski (see Kutek *et al.*, 1976) were assigned to the genera *Mirosphinctes* Schindewolf, 1926 and *Cubaspidoceras* Myczyński, 1976. According to Kutek *et al.* (1976) this part of the Artemisa Fm. is of the Late Oxfordian age. A higher ammonite-bearing horizon was found some tens of meters above the base of the formation. Ammonites from that horizon were studied by Imlay (1942) and Judoley & Furrázola-Bermudez (1968). Here are described two species from that horizon: from La Catalina (fig. 1) *Vinalesites rosariensis* (Imlay) and *Protancyloceras hondense* (Imlay).

Ammonites are usually very poorly preserved and scarce in the uppermost part of the Artemisa Fm. They usually represent uncoiled forms. Forms found here include: ?*Leptoceras* (*Protoleptoceras*) cf. *jelevi* Nikolov, *Thurmanniceras* cf. *novihispanicus* (Imlay), a representative of the family Neocomitidae and an unidentifiable uncoiled form. These forms appeared insufficient for reliable dating of the uppermost part of the Artemisa Fm. The strata are dated as the Valanginian (see Pszczółkowski *et al.* 1975) on the basis of microfossils in thin sections (de la Torre 1972—1975). It would then follow that sedimentation of the Artemisa Fm. continued since the Late Oxfordian to Valanginian.

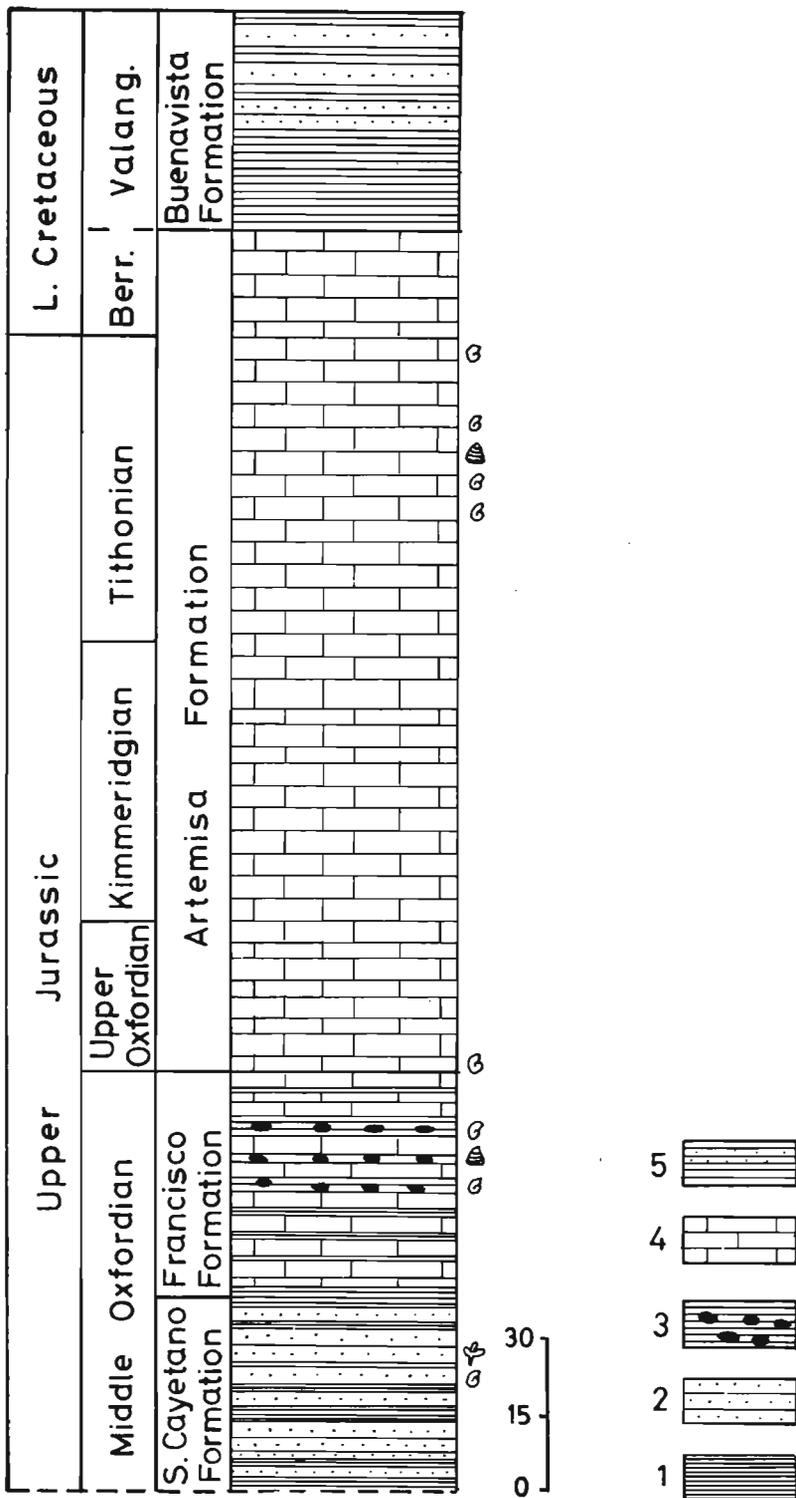


Fig. 2. Lithostratigraphic profile of Artemisa Formation from southern part of Sierra del Rosario: 1 clay shales, 2 sandstones, 3 limestones and shales with carbonate concretions, 4 limestones, 5 sandstones and shales, cherts.

In the southern part of Sierra del Rosario the strata of Artemisa Fm. are overlaid by sedimentary and volcanic strata of the Buenavista Fm. without ammonites (fig. 2).

LOWER CRETACEOUS STRATA OF THE NORTHERN SIERRA DEL ROSARIO

Polier Formation

The Polier Formation comprises gray-blue limestones with thin sandstone and shale intercalations (fig. 3), about 300 m in thickness. Strata of

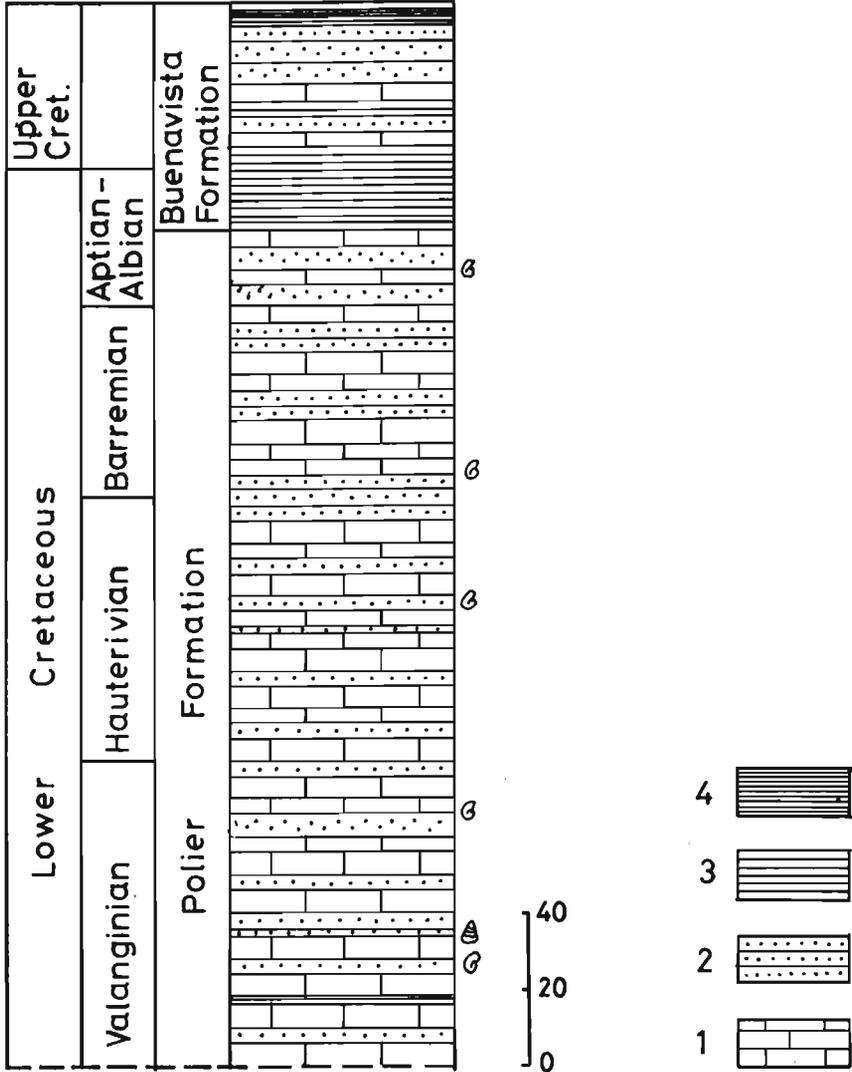


Fig. 3. Lithostratigraphic profile of Polier Formation: 1 limestones, 2 sandstones, 3 cherts, 4 clay shales.

that formation crop out in several localities in northern part of Sierra del Rosario, being best displayed north of Soroa in the Lomas de Polier area and north of Cinco Pesos locality.

The list of ammonites recorded thus far from the Polier Formation includes:

- | | |
|--|---|
| <i>Partschiceras infundibulum</i> (d'Orbigny) | <i>Moutoniceras</i> cf. <i>annulare</i> (d'Orbigny) |
| <i>Lytoceras</i> cf. <i>stephanense</i> Kilian | <i>Colchidites</i> cf. <i>colchicus</i> Djanelidze |
| <i>Lytoceras</i> sp. (undescribed) | <i>Pseudothurmannia</i> sp. |
| <i>Biasaloceras</i> cf. <i>subsequens</i> (Karakasch) | <i>Hemihoplites</i> sp. A |
| <i>Protetragonites</i> cf. <i>crebrisulcatus</i> (Uhlig) | <i>Bochianites</i> sp. |
| <i>Protetragonites</i> cf. <i>eichwaldi</i> (Karakasch) | <i>Hamulina</i> cf. <i>asteriana</i> d'Orbigny |
| <i>Protetragonites</i> cf. <i>mediocris</i> Drushtchits | ? <i>Hamulina</i> sp. |
| <i>Eotetragonites</i> sp. | <i>Anahamulina</i> cf. <i>subcincta</i> Uhlig |
| <i>Macroscaphites</i> cf. <i>yvani</i> (Puzos) | ? <i>Anahamulina</i> cf. <i>distans</i> Hohenegger |
| <i>Leptoceras</i> cf. <i>studeri</i> (Ooster) | <i>Ptychoceras</i> cf. <i>morloti</i> Ooster |
| ? <i>Leptoceras</i> (<i>Protoleptoceras</i>) cf. <i>jelevi</i> (Nikolov) | <i>Mexicanoceras</i> cf. <i>neohispanicum</i> (Böse) |
| <i>Karsteniceras polieri</i> sp.n. | <i>Olcostephanus</i> (<i>Rogersites</i>) cf. <i>filifer</i> Imlay (undescribed) |
| <i>Karsteniceras</i> sp. | <i>Balearites</i> cf. <i>nolani</i> Sarkar (undescribed) |
| ? <i>Karsteniceras</i> cf. <i>subtilis</i> (Uhlig) | <i>Thurmanniceras</i> cf. <i>novihispanicus</i> (Imlay) |
| ? <i>Karsteniceras</i> sp. A | <i>Kilianella pexiptycha</i> Uhlig |
| ? <i>Karsteniceras</i> sp. B | <i>Barremites</i> (<i>Barremites</i>) cf. <i>difficilis</i> (d'Orbigny) |
| <i>Hamulinites</i> cf. <i>parvulus</i> (Uhlig) | <i>Barremites</i> (<i>Barremites</i>) sp. |
| <i>Crioceratites pinarensis</i> sp.n. | ? <i>Zürcherella</i> sp. (undescribed) |
| <i>Crioceratites</i> ex gr. <i>thiollerei</i> (Astier) | <i>Spitidiscus</i> cf. <i>suenesi</i> (Kilian) |
| <i>Crioceratites</i> ex gr. <i>emerici</i> (Leveillé) | <i>Pulchellia</i> cf. <i>favrei</i> Ooster |
| <i>Crioceratites</i> sp. | <i>Nicklesia</i> cf. <i>dumasiana</i> (d'Orbigny) |
| ? <i>Crioceratites</i> sp. | ? <i>Heinzia</i> sp. (undescribed) |
| <i>Paracrioceras</i> cf. <i>elegans</i> (Koenen) | ? <i>Arrahaphoceras</i> cf. <i>substuderii</i> Spath |
| <i>Acrioceras</i> (<i>Acrioceras</i>) sp. | ? <i>Pleurohoplites machini</i> sp.n. and |
| <i>Acrioceras</i> (<i>Paraspinoceras</i>) <i>rosariensis</i> sp.n. | <i>Buchia</i> and <i>Aptychus</i> (<i>Lamellaptychus angulocostatus</i> Peters) |
| ? <i>Moutoniceras</i> cf. <i>moutonianum</i> (d'Orbigny) | |

Strata of the Polier Formation exposed at Lomas de Polier. — In the Lomas de Polier profile, situated by the road from Soroa to San Diego de Nuñez, the strata of the Polier Fm. occur in tectonic contact with the Upper Cretaceous limestones from below. The Polier Fm. is represented here by gray micritic limestones with gray sandstone and shale intercalations. Lower part of this profile yielded ammonites identified as *Karsteniceras polieri* sp.n. and *Karsteniceras* sp. The thickness of the highly calcareous part of that formation is estimated at 200 m. Above, there were found: *Protetragonites* cf. *crebrisulcatus* (Uhlig), *Protetragonites* cf. *eichwaldi* (Karakasch), *Pulchellia* cf. *favrei* Ooster, *Hamulina* cf. *astieriana* d'Orbigny, *Anahamulina* cf. *distans* Hohenegger, *Crioceratites* sp., *Spitidiscus* cf. *suenesi* (Kilian). These ammonites are accompanied by numerous aptychii of the group *Lamellaptychus angulocostatus* Peters (see Imlay, 1942, Houša, 1974b).

Upper part of the Polier Fm. is represented by light-gray thin-bedded sandstones with shaly and limestone intercalations and occasional, poorly preserved ammonites. More accurate dating is impossible, because the ammonites sufficiently preserved for identification and the index fossils are lacking in this part of the formation. The ammonites indicate the Valanginian-Barremian age of the whole formation.

Strata of the Polier Formation at Nortey (Casa Blanca). — This exposure is situated south of the road from Cayajabos to Soroa village, about 7 km W of Plan Rosario village. Upper part of the Polier Fm. exposed here is represented by light-gray limestones intercalated with sandstones and shales, yielding: *Partschiceras infundibulum* (d'Orbigny), *Lytoceras* sp., ?*Karsteniceras* sp. A, ?*Karsteniceras* sp. B, *Crioceratites pinarensis* sp.n., *Crioceratites* sp., *Moutoniceras* cf. *annulare* (d'Orbigny), *Colchidites* cf. *colchicus* Djanelidze, ?*Hamulina* sp., *Anahamulina* cf. *subcincta* Uhlig, *Anahamulina* cf. *distans* Hohenegger, *Ptychoceras* cf. *morloti* Ooster, *Nicklesia* cf. *dumasiana* d'Orbigny.

Such ammonite assemblage indicates the Lower Barremian age.

Strata of the Polier Formation at Loma Caldoso. — This exposure is situated west of the road from Cinco Pesos to Quiñones. Fine-grained sandstones with gray finely-grained limestone intercalations yielded: *Lytoceras* ex gr. *stephanensis* Kilian, ?*Eotetragonites* sp., *Macroscaphites* sp., ?*Arrhaphoceras* cf. *substuderi* Spath. This assemblage indicates the Barremian-Albian age.

Lucas Formation

This unit is represented by gray to dark-gray limestones with thin shale and flint intercalations (fig. 4). Strata of that formation crop out in a narrow belt continuing through northern part of Sierra del Rosario. The total thickness of that formation equals about 300 m. Fauna occurring here is generally very poorly preserved, but sufficiently for determining the age of that formation as the Upper Hauterivian — Lower Barremian.

The profile from the Rancho Lucas area. — This profile is displayed by cut of the road from Las Pozas towards El Pan de Guajaibon hill. A 50-meter section of strata of the Lucas Fm. here rests on younger strata along a tectonic contact plane. The ammonite fauna recorded from that locality includes:

?*Leptoceras* sp., ?*Protetragonites* sp., ?*Acrioceras* sp., *Crioceratites* sp., ?*Hamulina* sp., and *Lamellaptychus angulocostatus* (Peters). This faunal assemblage seems indicative of the Late Hauterivian or Early Barremian age.

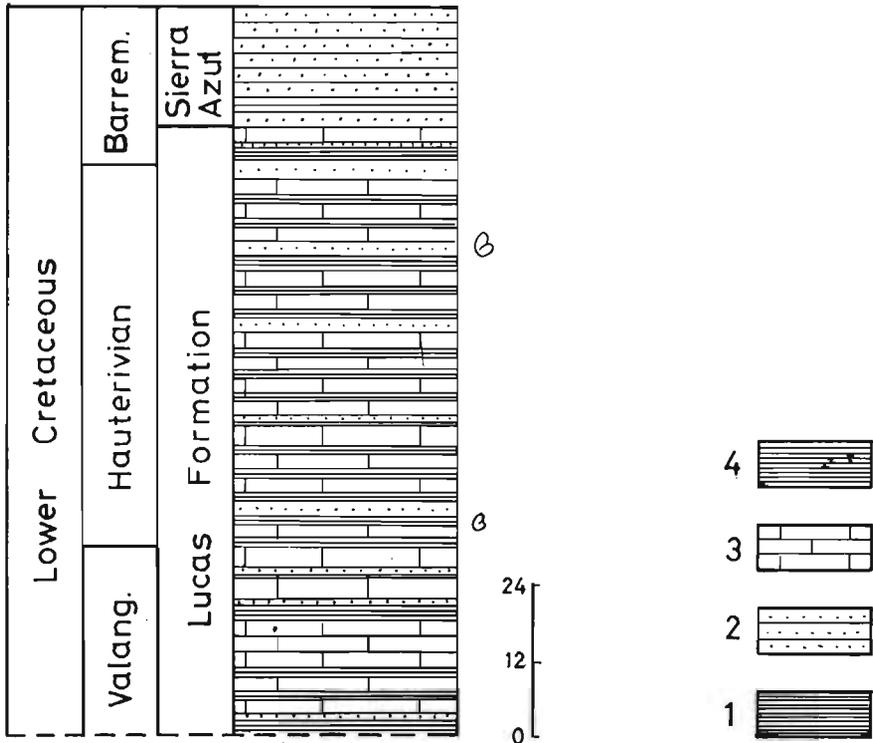


Fig. 4. Litostratigraphic profile of Lucas Formation: 1 clay shales, 2 sandstones, 3 limestones, 4 sandstones and cherts.

THE CHARACTERISTICS OF LOWER CRETACEOUS AMMONITES OF SIERRA DEL ROSARIO

The ammonites recorded from Lower Cretaceous strata of Sierra del Rosario are of a marked importance for both stratigraphy and zoogeography. The Lower Cretaceous ammonite assemblage is characterized by abundance of loosely coiled forms. Such ammonites first appear in the Tithonian strata of Sierra del Rosario where they are represented by *Protancyloceras hondense* (Imlay) (= ?*Leptoceras hondense* Imlay, 1942) and *Vinalesites* (or *Pseudoanahamulina* according to Judoley & Furrázola-Bermudez 1968) *rosariensis* (Imlay). According to R. Enay (pers. inf.) ?*L. catalinense* described by Imlay (1942) is conspecific with *Protancyloceras hondense* (Imlay). The generic status of these ammonites is disputable. According to Spath (1950) and Wiedmann (1973) they belong to the genus *Protancyloceras* which is questioned by R. Enay (pers. inf.).

Some uncoiled ammonites morphologically close to *Protancyloceras hondense* (Imlay) may be easily accommodated in the genus *Leptoceras* Uhlig, as interpreted by Thieuloy (1966). The ammonites assignable to that genus were recorded from strata currently assigned to the Berriasian-

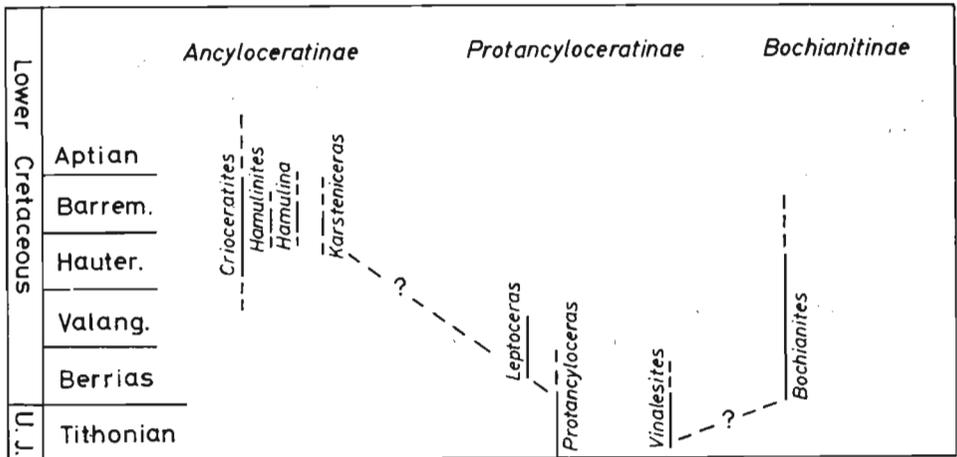


Fig. 5. Stratigraphic range of uncoiled ammonites recorded in Sierra del Rosario (partly after Wiedmann, 1973).

Valanginian of Sierra del Rosario (see fig. 5). A small break in occurrence of uncoiled ammonites was found in a part of the Lower Cretaceous section here assigned to the Upper Valanginian and Lower Hauterivian. The uncoiled ammonites do not appear in greater numbers below the Upper Hauterivian where they are represented by the genera *Crioceratites*, *Ptychoceras*, *Hamulinites*, *Hamulina*, *Karsteniceras* and others (see fig. 5). The upper boundary of the occurrence of these ammonites in Sierra del Rosario cannot be accurately delineated but it may be assumed that they do not pass the Barremian-Aptian boundary in that region.

The assemblage from Sierra del Rosario comprises some ammonites resembling those of the Lower Cretaceous from Mexico (see Imlay 1937, 1938). The ammonites, here assigned to *Mexicanoceras* cf. *neohispanicus* (Böse), *Olcostephanus* (*Rogersites*) cf. *filifer* (Imlay) and *Thurmanniceras* cf. *novihispanicus* (Imlay), suggest some biogeographic connections between Cuba and Mexico in the Early Cretaceous. The lack of the representatives of the genus *Substeuoceras*, common in coeval strata of Mexico, seems to speak against these connections.

The Lower Cretaceous ammonite assemblage of Cuba is characterized by a marked contribution of the representatives of the family Lytoceratidae Neumayr, which is typical of the coeval strata of the Tethyan region (see Wiedmann & Dieni 1968). This would suggest close connections with that region which is supported by the records of several typical Tethyan taxa from Cuba as e.g.: *Leptoceras* cf. *studerii* (Oester); *Macroscaphites* sp. A, *Hamulinites* cf. *parvulus* (Uhlig), *Colchidites* cf. *colchicus* Djanelidze, *Kilianella pexiptycha* Uhlig and *Spitidiscus* cf. *suenesi* (Kilian). Ammonite assemblages from the Mediterranean and Carpathian parts of the Tethyan Realm are characterized by the commonness of the genera *Anahamulina*,

Ptychoceras and *Barremites* (see Vašíček 1972) which are also very common in the coeval strata of Cuba. It may be concluded therefore that typical Tethyan ammonites form a marked part of the Lower Cretaceous ammonite assemblage of Cuba.

Some ammonites from Sierra del Rosario and especially the representatives of the genera *Nicklesia* and *Karsteniceras* suggest biogeographic connections with the Columbian basin (see Bürgl 1956, as well as Judoley & Furrázola-Bermúdez 1971). Most probably the Sierra del Rosario area has been directly connected with the Tethyan region as well as perennially with the basins of Mexico and South Andes.

Besides Sierra del Rosario the Lower Cretaceous ammonites were also recorded from the Las Villas region in Cuba by the Bulgarian mapping team (I. Kantchev, oral inf.).

In Sierra del Rosario ammonites (shells and aptychi — see Houša 1974b) are accompanied by pelecypods of the genus *Buchia* Rouillier, especially in lower parts of the Lower Cretaceous. This is worth to mention as pelecypods of that genus are very common in boreal Lower Cretaceous of Canada (see Jeletzky 1964, 1968). The Lower Cretaceous faunal assemblage from Sierra del Rosario seems to be devoid of other faunal elements, what impedes to reconstruct the sedimentary environment. It may be assumed that carbonate-terrigenous sediments of the Lower Cretaceous originated in deep marine basin. Similar sedimentary environment was assumed by Chapa (1963) in the case of ammonite-bearing Lower Cretaceous deposits of Mexico.

THE PROBLEMS CONNECTED WITH THE JURASSIC/CRETACEOUS BOUNDARY

The delineation of the Jurassic/Cretaceous boundary in Sierra del Rosario appears rather troublesome. This is mainly because of the existing controversy concerning the age of the Artemisa Formation. According to Imlay (1942) ammonites recorded there are indicative of the Tithonian whilst according to Judoley & Furrázola-Bermúdez (1968) — of the Lower-Middle Tithonian. From the uppermost part of this formation Houša (1974a) listed: *Protancyloceras* (*P. hondense*), *Vinalesites* (*V. rosariensis*) and *Bochianites*. The strata from Sierra del Rosario were assigned by Houša (1974a: 33) to the Upper Tithonian but it is not excluded that the strata yielding *P. hondense* (Imlay) and *V. rosariensis* (Imlay) already belong to the Berriasian. The tintinids (de la Torre 1972—1975, MS) were found directly above strata bearing the ammonite species in the Seboruco-Linares profile of the Artemisa Formation exposed in the bank of Los Palacios river (see Pszczółkowski *et al.* 1975). The tintinid assemblage comprises: *Calpionellopsis oblonga*, *C. simplex* (?), *Calpionellites darderi*

(?), *Tintinnopsella longa* and *Tintinnopsella cf. carpathica*, indicative of the Upper Berriasian-Lower Valanginian. This would indicate the Berriasian age of strata bearing *P. hondense* and *V. rosariensis*.

SYSTEMATIC DESCRIPTIONS

In descriptions of the ammonite fauna the following abbreviations are used: D—shell diameter, H—whorl height, E—whorl width, O—umbilical diameter, H/D—whorl height/shell diameter, E/D—whorl width/shell diameter, O/D—umbilical diameter/shell diameter; and in the case of uncoiled ammonites: D (total)—total shell diameter, D (initial)—diameter of spiral shell part, H—height of whorl of spiral shell part, O—umbilical diameter of spiral shell part. Following the suggestion made by Vašiček (1972), the term *proversum* is used for narrower arm and the term *retroversum*—for wider arm of uncoiled ammonite shell.

Family **Phylloceratidae** Zittel, 1884

Genus *Partschiceras* Fucini, 1920

Partschiceras infundibulum (d'Orbigny 1841)

(pl. 8:5)

1901. *Phylloceras infundibulum* d'Orbigny; Sarasin & Schöndelmayer: 11, pl. 1:1, 2.

1967. *Phylloceras infundibulum* d'Orbigny; Dimitrova: 19, pl. 6:1.

1969. *Partschiceras infundibulum* (d'Orbigny); Vašiček: 27, pl. 1:2.

Material.—One incomplete specimen (no. 2629).

Dimensions: H—32 mm; O—7.0 mm.

Remarks.—Despite of fragmentary preservation the specimen well agrees with those listed in the synonymy.

Occurrence.—Casa Blanca locality, limestones of Polier Formation. *Partschiceras infundibulum* (d'Orbigny) is known from the Upper Hauterivian and Lower Barremian of the Caucasus and France.

Family **Lytoceratidae** Neumayer, 1875

Genus *Lytoceras* Suess, 1865

Lytoceras cf. stephanense (Kilian, 1889)

Material.—One specimen (no. 2685).

Dimensions: D—44.0 mm; H—17.0 mm; O—15.0 mm; H/D—0.38; O/D—0.34.

Description.—Specimen preserved in the form of mould with obliterated sculpture. Inner whorls strongly overlapping one another. Whorl section rectangular; whorl sides flattened, slightly convex in initial shell part. Umbilicus wide, shallow, umbilical wall almost vertical. Heavy constrictions slightly bent towards the aperture, better marked close to the venter. Ventral side somewhat rounded.

Remarks.—The specimen is close to that assigned to *Lytoceras stephanense* Kilian by Fülöp (1958: pl. 8:1) differing in somewhat narrower umbilicus and more flattened whorl sides.

Occurrence.—Loma de Caldos, Polier Formation, Sierra del Rosario. *Lytoceras stephanense* (Kilian) is known from the Barremian of Hungary.

Genus *Biasaloceras* Drushtchits, 1953
Biasaloceras cf. *subsequens* (Karakasch, 1907)

Material. — One specimen (no. 2576).

Dimensions: D — 62.0 mm; H — 19.0 mm; O — 29.0; H/D — 0.30; O/D — 0.47.

Description. — Coiling involute; sculpture somewhat obliterated. Whorl sides somewhat convex, high. Umbilicus moderately wide, shallow. Weak constrictions.

Remarks. — The preservation is insufficient for identification with certainty. The specimen resembles that assigned to *Biasaloceras subsequens* (Karakasch) by Drushtchits (1956: 73, pls 1-4: 1-12) in coiling and dimensions. It is also somewhat similar to that assigned to the same species by Dimitrova (1967: 26, pl. 9:2, 2a) in all the features displayed by that fragmentarily preserved specimen. The Cuban specimen differs from that assigned to *Lytoceras sauculum* (Drushtchits 1956: 77, pl. 4:13) close to the former in umbilical diameter and markedly higher whorls.

Occurrence. — Soroa region, limestones of Polier Formation, Sierra del Rosario. *Lytoceras subsequens* (Karakasch) is known from the Barremian of Crimea, Caucasus and France.

Family **Tetragonitidae** Hyatt, 1900
 Genus *Protetragonites* Hyatt, 1900
Protetragonites cf. *crebrisulcatus* (Uhlig, 1883)

Material. — One specimen (no. 2592).

Dimensions: D — 33.0 mm; H — 11.0 mm; O — 13.0 mm; H/D — 0.33; O/D — 0.39.

Description. — Coiling involute, whorl sections convex, umbilicus wide and deep. Whorl sides displaying moderately deep constrictions inclined towards the aperture. Suture line obscured.

Remarks. — The specimen appears similar to *Protetragonites crebrisulcatus* (Uhlig) figured by Vašíček (1972: 40, pl. 3:5, pl. 15:1-2), differing in somewhat lower whorls.

Occurrence. — Lomas de Polier locality, limestones of Polier Formation, Sierra del Rosario. *Protetragonites crebrisulcatus* (Uhlig) is known from the Barremian and Lower Aptian of Majorca, Algeria, Austria, Roumania, Jugoslavia and Madagascar.

Protetragonites cf. *eichwaldi* (Karakasch, 1907)

Material. — One specimen (no. 2587a).

Dimensions: D — about 33.0 mm; H — 12.0 mm; O — 15.0 mm; H/D — about 0.37; O/D — about 0.45.

Description. — Specimen poorly preserved. Whorl sides weakly convex. Constrictions deep, somewhat wavy. Umbilicus wide, shallow.

Remarks. — The specimen appears somewhat similar to *Protetragonites eichwaldi* (Karakasch) presented by Drushtchits (1956: 95, pl. 6: 24ab), differing somewhat in dimensions. Moreover, its preservation is insufficient for any reliable specific identification.

Occurrence. — Lomas de Polier locality, limestones of Polier Formation, Sierra del Rosario. *Protetragonites eichwaldi*, to which the specimen is similar, is known from the Barremian of Crimea and Caucasus.

Protetragonites cf. mediocris Drushtchits, 1956

Material. — One specimen (no. 2549).

Dimensions: D — 51.0 mm; H — 15.5 mm; O — 23.0 mm; H/D — 0.30; O/D — 0.45.

Description. — Specimen flattened; coiling involute; whorl sides weakly convex. Umbilicus wide, shallow; moderate constrictions deep, about 5 in number per whorl.

Remarks. — The preservation of the specimen precludes identification with certainty. The character of constrictions and mode of coiling seem similar to those typical of *Protetragonites* (see Drushtchits 1956:97, pl. 6: 21ab, Dimitrova 1967:29, pl. 10:2).

Occurrence. — Brasiliano Roble — Belén Vigoa locality, Polier Formation, Sierra del Rosario. *Protetragonites mediocris* Drushtchits is known from the Aptian of Crimea and the Barremian of Bulgaria.

Genus *Eotetragonites* Breistroffer, 1947*Eotetragonites* sp.

Material. — One specimen (no. 2548).

Dimensions: D — 23.0 mm; H — 8.5 mm; O — 7.5 mm; H/D — 0.37; O/D — 0.32.

Remarks. — The specimen is characterized by evolute coiling, subquadrate rounded whorl section, whorls overlapping one another in one-third of height and with moderately deep constrictions about 6 in number per whorl; umbilicus wide and shallow, umbilical wall vertical. It presumably belongs to the genus *Eotetragonites* Breistroffer. Its preservation is insufficient for specific identification.

Occurrence. — Loma Caldosó locality, limestones of Polier Formation, Sierra del Rosario.

Family **Macroscaphitidae** Hyatt, 1900Genus *Macroscaphites* Meek, 1876*Macroscaphites cf. yvani* (Puzos, 1831)

(pl. 3:6)

Material. — One specimen (no. 2688).

Dimensions: D (coiled part) — 28.0 mm; H — 9.0 mm; O — 13.0 mm; H/D — 0.32; O/D — 0.46.

Description. — Inner whorls tightly planispirally coiled. The end of proversum straightened, retroversum not preserved. Ornamentation consisting of straight, somewhat prosoclinal, densely spaced (25 per a half of whorl) ribs; some intercalary ribs occur. The ribs end with some swelling at ventral margin. Constrictions not present; suture line obscure.

Remarks. — The specimen resembles *Macroscaphites yvani* (Puzos) (see Vašiček 1972:46, pl. 4:3, pl. 5:1; Drushtchits 1958:61, pl. 23:1; Nikolov 1964:120, pl. 1:2) in the mode of coiling and, partly, in ornamentation, somewhat differing in dimensions and ribs less densely spaced and somewhat thicker on inner whorls.

The specimen also resembles *Macroscaphites binodus* Uhlig (see Baccelle & Garavello 1967:134, pl. 2:3), in swellings marked at the end of ribs close to ventral margin, but the holotype of the latter is characterized by more distinct tubercles on ventral margin and finer ribs.

Occurrence.—Loma Caldoso locality, Polier Formation, Sierra del Rosario. *Macroscaphites yvani* (Puzos) is known from the Upper Barremian and Lower Aptian of France, F.R.G. and Jugoslavia.

Family **Ancyloceratidae** Meek, 1876
Genus *Protancyloceras* Spath, 1924
Protancyloceras hondense (Imlay, 1942)
(pl. 13:2-5)

1942. ?*Leptoceras hondense* Imlay: 1456, pl. 10:5-9, 11, 12.

1968. *Protancyloceras hondense* (Imlay); Judoley & Furranzola: 53, pl. 1:3.

Material.—Seven specimens (no. 2664a, b, c, 2653a, b, 2542a, b).

Dimensions: 2664a D—18.0; H—3.0; O—13.0; H/D—0.17; O/D—0.8.

2664b D—16.0; H—3.0; O—11.0; H/D—0.18; O/D—0.69.

2664c D—15.5; H—3.0; O—19.0.

2653a D—22.5; H—3.5; O—16.0; H/D—0.15; O/D—0.7.

2653b D—8.5; H—2.0; H/D—0.23.

2542 D—12.0; H—3.0; O—7.0; H/D—0.25; O/D—0.58.

2542b D—13.0; H—3.5; O—8.0; H/D—0.27; O/D—0.61.

Remarks.—All the specimens are consistent with figures and description of that species given by Imlay (1942). ?*Leptoceras hondense* Imlay was subsequently placed in the genus *Protancyloceras* Spath, 1924, by Spath (1950), Thieuloy (1966), Judoley & Furranzola-Bermudez (1968) and others. This species as well as *Protancyloceras catalinense* (Imlay) which may be its synonym, are very close to the specimen of *Leptoceras brunneri* (Ooster) described by Thieuloy (1966:290, pl. 1:1, pl. 2:1) in the mode of coiling of inner whorls and ornamentation. Moreover, it seems that *Protancyloceras hondense* (Imlay) is closer to the genus *Leptoceras* Uhlig *sensu stricto*, which was already suggested by Imlay (1942), than to the genus *Protancyloceras* Spath.

Occurrence.—*Protancyloceras hondense* (Imlay) is fairly common in strata of the Artemisa Formation from Sierra del Rosario. The specimens presented here were found: 2542a and b— at La Zarza elevation, south of Cinco Pesos, Artemisa Formation, La Zarza member; 2643a and b— at San Miguel, north of Candelaria, Artemisa nad Polier Fm. junction beds; 2664a, b and c— at Loma del Rubi (Romero), lower part of Polier Formation. The stratigraphic range of *P. hondense* (Imlay) comprises the Upper Tithonian in Cuba (Imlay, 1942).

Protancyloceras cf. *kurdistanense* Spath, 1950
(pl. 4:4)

Material.— One specimen (no. 2547).

Dimensions: D—22.0 mm; H—3.5 mm.

Description.—Coiling loose, protancyloceratid-like. Whorl sides convex. Ornamentation consisting of numerous, coarse prosoclineal ribs. Initial shell part not preserved.

Remarks.—The specimen appears somewhat similar to *Protancyloceras kurdistanense* Spath (see Spath 1950:121, pl. 9:1-5) differing in ribs less incurved in sub-apertural zone. It differs from Cuban forms assigned to *Protancyloceras hondense* (Imlay) and *P. catalinense* (Imlay) in the mode of coiling (a smaller degree of shell coiling) and in dimensions.

Occurrence. — La Catalina locality, limestones of Artemisa Formation, Sierra del Rosario, ?Upper Tithonian. *P. kurdistanense* is known from the Tithonian of Kurdistan.

Genus *Vinalesites* Thieuloy, 1966
Vinalesites rosariensis (Imlay, 1942)
(pl. 3:1)

1942. *Hamulina* ? *rosariensis* Imlay: 1457, pl. 9:1-11; pl. 12:1.

1968. *Pseudoanahamulina rosariensis* (Imlay); Judoley & Furrzola: 54, pl. 1:4; pl. 2:1-2; pl. 79:2.

Material. — Over a dozen poorly preserved specimens (no. 2537).

Remarks. — All the specimens are consistent with descriptions and illustrations referred to in the synonymy.

Occurrence. — La Catalina locality, limestones of Artemisa Formation, Sierra del Rosario. Previously reported from strata of the same formation exposed in several other localities. The stratigraphic range — Upper Tithonian according to Imlay (1942).

Genus *Leptoceras* Uhlig, 1883
Leptoceras cf. *studer* (Ooster, 1860)
(pl. 4:2)

Material. — One specimen (no. 2664).

Dimensions: D — 16.5 mm; H — 5.5 mm; O — 8.0 mm; H/D — 0.33; O/D — 0.48; 23 ribs per a half of whorl.

Description. — Coiling loose. Whorls slightly touching one another, except for the last whorl which is more loosely coiled. Whorl sides including ventral side ornamented with numerous, strong, somewhat wavy ribs; inter-rib spaces twice wider than ribs. Two wide wavy constrictions visible on outer whorl. Peristome not preserved.

Remarks. — The specimen appears close to *Leptoceras studeri* (Ooster) (see Thieuloy 1966:291, pl. 1:2-6, pl. 2:2-8) in general style of coiling and ornamentation and in whorl section, differing in dimensions, density of ribbing (17 and 23 ribs per a half of whorl, respectively), less rectiradial ribs in especially subapertural whorl part and in generally looser coiling of shell.

Occurrence. — Loma del Rubí locality, limestones of Polier Formation, Sierra del Rosario. *Leptoceras studeri* (Ooster) is known from the Upper Beriasian and Lower Valanginian.

? *Leptoceras* (*Protoleptoceras*) cf. *jelevi* (Nikolov, 1967)
(pl. 4:6)

Material. — One specimen (no. 2535a).

Dimensions: D — 21.0 mm; H — 6.0 mm; O — 12.5 mm; H/D — 0.28; O/D — 0.59.

Description. — Coiling loose; the ultimate whorl touching the penultimate; some uncoiling takes place in the case of apertural part of the ultimate whorl. Whorl sides markedly convex. Whorls ornamented with strong, somewhat wavy ribs passing through the venter and sometimes bifurcating at the ventral margin; inter-rib spaces twice wider than ribs. Initial whorls not preserved.

Remarks.—The specimen appears somewhat similar to *Protoleptoceras jelevi* (Nikolov). It differs from *P. jelevi jelevi* Nikolov (Nikolov 1967:38, pl. 1:1-12; pl. 2:2-5, 9, 11-12; pl. 3:1a, 3, 5, 9-10, pl. 4:1, 2-6; Dimitrova 1967:34, pl. 12:2-3) in somewhat wider umbilicus and lower last whorl whilst all the other features are essentially consistent with the diagnosis of the subspecies. According to Wiedmann (1973:312) the name *Protoleptoceras* Nikolov, 1967 is not valid and it should be treated as a junior synonym of the name *Leptoceras* Uhlig, 1883, with the type species *Leptoceras brunneri* (Ooster). This point of view seems supported by a remarkable similarity of the type species of *Protoleptoceras*, i.e. *P. jelevi* Nikolov (see Nikolov 1967:38), and that of *Leptoceras*—*Leptoceras brunneri* (Ooster) (see Thieuloy 1966:284). At the same time Wiedmann (op. cit.) put in brackets the generic name of Barremian species, *Leptoceras pumilum* Uhlig, which would suggest the necessity of expulsion of that species of the genus *Leptoceras* Uhlig in a narrower sense.

Occurrence.—Exposure by the road from Sabanilla to Memeyal, limestones of Artemisa Formation, Sierra del Rosario. *Protoleptoceras jelevi* Nikolov is known from the Berriasian of Bulgaria.

Genus *Karsteniceras* Royo y Gomez, 1945

Karsteniceras polieri sp.n.

(pl. 4:1, 3, 7)

Holotype: Specimen no. 2556b, Inst. Geol. Paleont., Havana; pl. 4:7.

Type horizon: Lower Barremian, limestones of Polier Formation.

Type locality: Lomas de Polier locality in Sierra del Rosario, Pinar del Río province.

Derivation of the name: from Lomas de Polier elevation in Sierra del Rosario (western Cuba).

Paratypes: Specimens no. 2556a, 2556c, 2558, 2579a.

Diagnosis.—Small-size *Karsteniceras* with cryoceraticonic type of coiling. Outer whorl ornamented with densely spaced, thin, mainly single prorsiradiate ribs occasionally dichotomically dividing on umbilical margin. Not constricted.

Material.—Five almost complete, somewhat flattened specimens.

Dimensions: 2556b (holotype) D—16.0 mm; H—5.0 mm; O—8.0 mm; H/D—0.31; O/D—0.5; about 31 ribs per a half of whorl;

no. 2556c D—about 17.0; H—5.0; O—9.0.

no. 2558 D—17.0; H—5.5; O—9.0; H/D—0.32; O/D—0.52.

no. 2556a D—16.2; H—5.5; O—8.0; H/D—0.33; O/D.

no. 2579a D—14.0; H—4.5; O—7.5; H/D—0.32; O/D—0.53.

no. 2579b D—15.0; H—5.0; O—7.0; H/D—0.33; O/D—0.46.

no. 2556d H—5.5; O—8.0.

no. 2556e D—16.0; H—5.5; H/D—0.34.

no. 2569a H—6.0.

Description.—Specimens small, with spire of the cryoceraticonic type. Initial whorls not preserved. Outer whorl ornamented with numerous (30-32 ribs per a half of whorl), thin, prorsiradiate ribs, very densely spaced at the beginning of the last whorl and somewhat less dense close to the peristome. Some ribs dichotomically dividing close to umbilical margin. Additional material is required for stating whether or not the ventral side is tuberculated. There are no constrictions nor thick ribs. Suture line obscured.

Remarks.—*Karsteniceras polieri* sp.n. is not close to *Leptoceratoides subtilis* (Uhlig) figured by Vašiček (1972:54, pl. 7:4, and fig. 16), differing in the lack of constrictions, prorsiradiate and more numerous ribs (about 30 and 26 ribs per a half

of the last whorl, respectively). It differs from *Leptoceratoides pumilus* (Uhlig) (see Vašíček 1972:54, pl. 4:5) in somewhat smaller dimensions, finer and markedly prorsiradiate and sometimes dischizotomous ribs. The two Uhlig species were assigned to the genus *Leptoceratoides* Thieuloy by Vašíček (1972) after Thieuloy (1966). According to Wiedmann (1973) they should be assigned to the genus *Karsteniceras* Royo y Gomez, 1945. The latter point of view is accepted here.

Occurrence.—Lomas de Polier locality, limestones of Polier Formation, Sierra del Rosario. The genus *Karsteniceras* Royo y Gomez, 1945 is known from the Barremian of Crimea, Algeria, Morocco and Columbia.

Karsteniceras sp.

(pl. 4:8-11; pl. 5:1, 2)

Material.—Four complete specimens (2648, 2648a, 2648b and 2649) and some fragments.

Description.—Small-sized *Karsteniceras* with cryoceratonic type of coiling. Ribs initially straight and densely spaced, later wavy.

Dimensions: no. 2648 D—16.0; H—5.0; O—7.0; H/D—0.31; O/D—0.43.

no. 2647 D—13.0; H—4.5; O—6.0; H/D—0.33; O/D—0.46.

no. 2648a D—13.0; H—3.5; O—8.5; H/D—0.29; O/D—0.50.

no. 2648b D—20.0; H—6.0; O—9.5; H/D—0.30; O/D—0.47.

no. 2649 D—13.0; H—4.5; O—6.0; H/D—0.34; O/D—0.46.

Remarks.—The specimens are somewhat similar (especially in the case of inner whorls) to *Karsteniceras polieri* sp.n. in densely-spaced, straight, somewhat prorsiradiate ribs. On outer whorl the ribs become markedly straighter than in *K. polieri*. The specimens differ from those of *Karsteniceras beyrichi* (Karsten) (see Dimitrova 1967:38, pl. 12:6) in wavy course of ribs and in dimensions.

Occurrence.—El Herete locality, limestones of Polier Formation, Sierra del Rosario, presumably the Lower Barremian (the specimens were found together with *Hemihoplites* sp. A).

?*Karsteniceras* cf. *subtilis* (Uhlig, 1883)

(pl. 4:5)

Material.—One specimen (no. 2653c).

Description.—A fragment of the last whorl with convex sides and strongly prorsiradiate ribs; inter-rib spaces narrow and deep.

Remarks.—The specimen resemble those assigned to *Leptoceras subtile* Uhlig by Dimitrova (1967:39, pl. 12:7) and the specimen described as *Leptoceratoides* cf. *subtilis* (Uhlig) by Vašíček (1972:55, pl. 5:4 only). The latter differ from the specimen figured by Dimitrova (1967) in heavier ornamentation and lower last whorl which makes it more similar to the specimen described here.

Occurrence.—San Miguel locality, limestones of Artemisa Formation, ?Lower Barremian, Sierra del Rosario.

?*Karsteniceras* sp. A

(pl. 5:4, 5)

Material.—Two flattened specimens (no. 2635a₁ and 2635a₂).

Dimensions: 2635a₁—D total—10.0 mm; D initial shell part—3.0 mm; H—3.0; distance between initial shell part and the last whorl—2.5 mm.

2635a₂ — D total — 8.0 mm; D initial shell part — 2.0 mm; H — 2.5 mm; distance between initial shell part and the last whorl — 2.2 mm.

Description. — Small-size specimen; whorls initially tightly and later loosely coiled. Ornamentation very weak, consisting of fine, single prorsiradiate ribs somewhat better marked on ventral margin. The specimen no. 2635a₂ differs from the specimen no. 2635a₁ in more loose coiling and weaker ornamentation.

Remarks. — The systematic position of the specimens is difficult to establish because of scarcity and poor preservation of the material. In the ornamentation and mode of coiling it is somewhat close to the genus *Velezicerias* Wright, 1957 (fide Vašíček, 1972). According to Wiedmann (1973) the name *Velezicerias* should be treated as junior synonym of *Karstenicerias* Royo y Gomez (1945). The specimens analysed here are characterized by the mode of coiling of inner whorls somewhat different from that typical of the genus *Karstenicerias* Royo y Gomez (fide Wiedmann, 1973: 310, fig. 1), so they are assigned to that genus with reservation.

Occurrence. — Casa Blanca locality, limestones of Polier Formation, Barremian, Sierra del Rosario.

?*Karstenicerias* sp. B

(pl. 5:3)

Material. — Three specimens (668-98a, b, c).

Dimensions: 98a — D total — 10.0 mm; D initial shell part — 1.5 mm; H — 2.8 mm; distance between initial shell part and the last whorl — 4.0 mm;

no. 98b — D total — 10.0 mm; H — 2.0 mm; no. 98c — D total — 8.5 mm; H — 2.0 mm.

Description. — Small-sized specimen with initial whorls closely coiled. The last whorl loosely coiled (the type of coiling similar to that of ?*Karstenicerias* sp. A). Ornamentation initially weak, becoming stronger in the middle part of shell, consisting of single, sharp-crested, somewhat rectiradiate ribs and presumably of small tubercles at ventral margin.

Remarks. — The specimens are somewhat close to specimens of the genus *Leptoceratoides* Thieuloy, 1966 (= *Karstenicerias* Royo y Gomez, 1945 according to Wiedmann 1973) and especially *L. cf. subtilis* (Uhlig) figured by Vašíček (1972:55, pl. 5:4 only). The Vašíček specimen is characterized, however, by somewhat different initial whorls and stronger ribbing.

Occurrence. — Casa Blanca locality, limestones of Polier Formation, Barremian, Sierra del Rosario.

Genus *Hamulinites* Paquier, 1900

Hamulinites cf. parvulus (Uhlig, 1883)

Material. — One, poorly preserved specimen (no. 2591a).

Dimensions: Length of proversum — 40.0 mm; length of retroversum — 10.0 mm; maximum width of proversum — 5.0; max. width of retroversum — 6.0 mm.

Description. — Small-sized shell. Proversum slightly bent, whorl sides convex. Ornamentation consisting of numerous, somewhat wavy ribs; inter-rib spaces narrow and deep. Retroversum bent hook-like.

Remarks. — The specimen is somewhat similar to those assigned to *Hamulinites parvulus* Uhlig by Dimitrova (1967:36, pl. 17:7) and Vašíček (1972:53, pl. 7:2, fig. 15) but its preservation is insufficient for any reliable identification. Dimitrova (1967)

assigned the species to the genus *Eoleptoceras* Manalov, 1962 which generic name is treated as junior synonym of *Hamulinites* Paquier, 1900, by Wiedmann (1973).

Occurrence.—Lomas de Polier locality, Polier Formation, Barremian, Sierra del Rosario. *Hamulinites parvulus* (Uhlig) is known from the Barremian of Silesia and Lower Barremian of Bulgaria.

Genus *Crioceratites* Leveillé, 1837

Crioceratites pinarensis sp.n.

(pl. 5:6)

Holotype: Specimen no. 2641, Inst. Geol. Paleont., Havana; pl. 5:6.

Type horizon: ?Lower Barremian, Polier Formation.

Type locality: Casa Blanca locality by the road from Cayajabos to Soroa, Sierra del Rosario, Pinar del Río.

Derivation of the name: From the Pinar del Río province, western Cuba.

Diagnosis.—Form with cryoceraticonic type of coiling, with very dense ribbing and spines on ventrolateral side of the last whorl.

Material.—The holotype only.

Dimensions: D—35.0 mm; H—13.5 mm; O—19.0 mm; H/D—0.38; O/D—0.54.

Description.—Small-sized specimen with coiling of the cryoceraticonic type. Initial whorls, 2 mm in diameter, are very tightly coiled and the last whorl loosely coiled. Ornamentation consisting of thin, densely-spaced, rectiradiate ribs united in 2 to 3 in dorsolateral zone. Ventrolateral side with marked swellings and short, wide spines.

Remarks.—The specimen is close to that described as *Crioceratites (Pseudothurmannia) balearis* Nolan by Baccelle & Garavello (1967:138, pl. 3:3) in the type of ribbing, differing in the mode of coiling and development of ventrolateral spines. The specimen markedly differs from those listed in the synonymy of that species by Baccelle & Garavello (1967). At present the Nolan species is allocated in the genus *Balearites* Sarkar, 1955, by Dimitrova (1967:75) in having strongly developed ventrolateral spines.

Occurrence.—Casa Blanca locality, limestones of Polier Formation, Lower Barremian, Sierra del Rosario.

Crioceratites ex gr. *thiollerei* (Astier, 1851)

Material.—One specimen (no. 2654).

Dimensions: D—18.0 mm; H—7.0 mm (close to the peristome); O—9.0 mm; H/D—0.39; O/D—0.50.

Remarks.—Sculpture is obliterated which precludes a reliable identification. The mode of coiling, prominent ventral tubercles and long spines connected with them suggest the affiliation of the specimen with the group of *Crioceratites thiollerei* (Astier) (see Sarkar 1955:34, 74; Thomel 1964:30; Dimitrova 1967:46, pl. 14:2, 2a, pl. 15:2).

Occurrence.—Outcrop south of La Mosca, limestones of Polier Formation, Sierra del Rosario. *Crioceratites thiollerei* (Astier) is known from the Barremian of France.

Crioceratites sp. A

(pl. 5:7)

Material. — One specimen (no. 2625).

Dimensions: D — 25.0 mm; H — 8.0 mm; O — 14.0 mm; H/D — 0.32; O/D — 0.56.

Description. — Specimen moderate in size, with coiling of the cryoceratitic type. Inner whorls spirally coiled, outer whorl loosely coiled. Whorl sides convex; whorls thickest in the mid-height. Ornamentation consisting of numerous fine straight or slightly prorsiradiate ribs (ribbing of the acrioceratic type), and wide spines on the ventral side. Suture line obscure.

Remarks. — The specimen is somewhat similar to the holotype of *Crioceratites ramkrishnai* Sarkar (Sarkar 1955:38, pl. 1:1) in ribbing, differing in trend to uncoiling and development of ventral spines. It differs from other species of the genus *Crioceratites* Leveillé, 1837, and presumably represents a new species of that genus.

Occurrence. — Casa Blanca locality, limestones of Polier Formation, Barremian, Sierra del Rosario.

?Crioceratites sp.

(pl. 5:8)

Material. — One poorly preserved specimen (no. 2570).

Dimensions: D — 28 mm; H — 6.5 mm; O — 15.0 mm; H/D — 0.25; O/D — 0.53.

Remarks. — Whorls initially tightly and later loosely coiled. Whorl height steadily increasing. Ornamentation consisting of numerous fine single and possibly some biplicate ribs as well as poorly visible tubercles marked on ribs and ventral side. This specimen appears somewhat close to *Crioceras sablieri* Astier (*vide* Sarkar 1955:54, pl. 34:1), differing in ornamentation of outer whorls; moreover, the latter is characterized by markedly coarser ribs tuberculated on the ventral side. The identification is additionally impeded by unsatisfactory preservation of the Cuban specimen.

Occurrence. — Lomas de Polier locality, limestones of Polier Formation, ?Barremian, Sierra del Rosario.

Genus *Paracrioceras* Spath, 1924*Paracrioceras* cf. *elegans* (Koenen, 1902)

(pl. 5:9; pl. 6:1)

Material. — Two specimens (no. 2668a and b).

Dimensions: no. 2668a D — 14.5 mm; H — 5.5 mm; O — 6.0 mm; H/D — 0.38, O/D — 0.41.

no. 2668b D — 15.5; H — 5.5; O — 6.5; H/D — 0.35; O/D — 0.41.

Description. — Coiling loose, involute; whorl height rapidly increasing along with shell size. Whorl sides somewhat flattened. Umbilicus wide, shallow; umbilical margin rounded, umbilical wall vertical. Ventral side obscure. Inner whorls ornamented with numerous fine, somewhat prosoclinal ribs becoming thicker and straighter on the last whorl; inter-rib spaces about twice wider than the ribs. The ribs are sometimes united in pairs below ventral margin; the point of convergence of ribs is emphasized by small tubercles (about 13 tubercles per a half of whorl). Internal tubercles not visible (?obliterated).

Remarks.—The specimens are similar to that of *Paracrioceras elegans* (Koenen) figured by Wright (*in*: Arkell *et al.* 1957:208, fig. 238/3), but their preservation is insufficient for allocation in that species without reservation.

Occurrence.—San Miguel locality, limestones of Polier Formation, Sierra del Rosario. *Paracrioceras elegans* (Koenen) is known from the Barremian of F.R.G.

Genus *Acrioceras* Hyatt, 1900, emend. Sarkar, 1955

Acrioceras (Acrioceras) sp.

(pl. 5:10)

Material.—One specimen (no. 2559).

Dimensions: Length of specimen—20.0 mm; height of subperistomal part—5.0 mm; length of subperistomal part—8.0 mm.

Remarks.—The specimen is similar to *Acrioceras (Acrioceras) breistrofferi* Sarkar (1955:120, pl. 7:3) in coiling of the crioceratic type and strong, somewhat oblique ribs bearing tubercles, differing in higher number of ribs. The identification is additionally impeded by unsatisfactory preservation of the Cuban specimen.

Occurrence.—Lomas de Polier locality, limestones of Polier Formation, Sierra del Rosario. The genus *Acrioceras* Hyatt, 1900, is known from the Hauterivian and Barremian of Europe and California (Dimitrova 1967) and *A. (A.) breistrofferi* Sarkar— from the Barremian of France (Sarkar 1955).

Acrioceras (Paraspinoceras) rosariensis sp.n.

(pl. 6:2)

Holotype: Specimen no. 2574. Inst. Geol. Paleont., Havana; pl. 6:2.

Type horizon: ?Upper Valanginian—?Lower Barremian, limestones of Polier Formation.

Type locality: Outcrop north of Soroa, by the road from Soroa to Cayajabos.

Derivation of the name: From the mountain belt Sierra del Rosario in the Pinar del Río province, western Cuba.

Material.—Holotype only.

Dimensions: Length 23.0 mm; width—3.0 mm; width of subperistomal zone—6.0 mm.

Diagnosis.—Small-sized specimen with coiling of the acrioceratic type, numerous ribs set oblique to shell axis, ventral margin tuberculated.

Description.—Initial whorls not preserved. The preserved fragment is initially arcuate, bending at the angle of 110° close to the peristome. Ornamentation consisting of oblique, single ribs and tubercles; lower part of whorl is ornamented with various coarses and finer ribs whilst the subperistomal whorl part—with ribs uniform in thickness and somewhat bent backwards; tubercles preserved only at the ventral margin in subperistomal whorl part.

Remarks.—The specimen resembles *Acrioceras (Paraspinoceras) pulcherrimum* d'Orbigny described by Sarasin & Schönölmayer (1902:137, pl. 17:5, pl. 18:3), Sarkar (1955:126), Thomel (1964:47, pl. 7:6), differing in ornamentation differentiated and not uniform throughout the development and in subperistomal zone not so strongly bent. The differences in respect to other species of the subgenus *Paraspinoceras* Breistroffer, 1951, in morphology and shape of shell are markedly greater.

Occurrence.—Outcrop north of Soroa by the road from Soroa to Cayajabos, limestones of Polier Formation, ?Hauterivian—?Barremian, Sierra del Rosario.

Family **Heteroceratidae** Hyatt, 1900Genus *Moutoniceras* Sarkar, 1954? *Moutoniceras* cf. *moutonianum* (d'Orbigny, 1850)

(pl. 6:4)

Material. — One incomplete specimen (no. 2554).

Dimensions: D — 35.0 mm; H — 9.0 mm; O — 20.0 mm; H/D — 0.25; O/D — 0.57.

Description. — First whorls coiled in the form of loose spire; subperistomal part of the last whorl eccentrically coiled. Ornamentation of inner whorls obliterated; straightened shell part ornamented with strong ribs somewhat bent towards the aperture. Inter-rib spaces narrow and shallow.

Remarks. — The specimen resembles those assigned to *Moutoniceras moutonianum* (d'Orbigny) by Sarkar (1955:158, pl. 11:4) and Thomel (1964:62, pl. 12:5) in ornamentation, mode of coiling and dimensions, differing in somewhat coarser ribs. It also resembles the specimen described as "*Crioceratites*" (?gen. nov.) *astieri* by Sarkar (1955: pl. 7:29) but it is not excluded that the latter specimen also belongs to d'Orbigny's species.

Occurrence. — Bracilano Roble — Belen Vigoa locality, limestones of Polier Formation, Sierra del Rosario. *Moutoniceras moutonianum* (d'Orbigny) is known from the Upper Barremian of France.

Moutoniceras cf. *annulare* (d'Orbigny, 1840)

Material. — Two whorl fragments (no. 2235a, and b).

Dimensions: no. 2235a — maximum width of whorl — 8.0 mm

no. 2235b — maximum width of whorl — 10.0 mm.

Remarks. — Whorl sides convex, ornamented with numerous, subradial heavy ribs; inter-rib spaces narrow and moderately deep. The specimens in all their features preserved are similar to *Moutoniceras annulare* (d'Orbigny) figured by Sarasin & Schöndelmayer (1902:124, pl. 15:2) and Thomel (1964:63, pl. 11:1, 3; pl. 12:3), but their preservation is insufficient for identification with certainty. The d'Orbigny's species was assigned by Sarasin & Schöndelmayer (1902) to the genus *Crioceras* Leveillé, 1837 but it should be transferred to the genus *Moutoniceras* Sarkar, 1954, according to Sarkar (1955).

Occurrence. — Casa Blanca locality, limestones of Polier Formation, Sierra del Rosario. *Moutoniceras annulare* (d'Orbigny) is known from the Upper Hauterivian of France.

Genus *Colchidites* Djanelidze, 1924*Colchidites* cf. *colchicus* Djanelidze, 1924

(pl. 6:3)

Material. — One specimen preserved in the form of mould (no. 2612).

Dimensions: Length of retroversum — 16.0 mm; length of proversum — 25.0 mm; width of retroversum — 7.0 mm; width of proversum — 2.5 mm (minimum) and 4.0 mm (maximum); distance between arms — 2.1 mm; diameter of spire — 6.0 mm.

Description. — Whorls at first spirally (?helicoidally) coiled, later straight. Narrower arm (proversum) becoming gradually wider and bending in the form of hook. Wider arm (retroversum) short and wide. Ornamentation of inner whorls and proversum obliterated. Retroversum ornamented with straight ribs converging at dorsal margin and sometimes bifurcating at ventral margin.

Remarks.—The specimen is similar to that figured as *Colchidites colchicus* Djanelidze by Drushtchits (1958:105, pl. 49:4), differing somewhat in ribbing of retro-versum and dimensions.

Occurrence.—Casa Blanca locality, Polier Formation, Sierra del Rosario. *Colchidites colchicus* Djanelidze is known from the Lower Aptian of Georgia (USSR).

Family **Hemihoplitidae** Spath, 1924
Genus *Pseudothurmannia* Spath, 1923
Pseudothurmannia sp.

Material.—One poorly-preserved specimen (no. 2647).

Remarks.—The specimen is somewhat similar to that figured as *Pseudothurmannia angulicostata* (d'Orbigny) by Dimitrova (1967:72, pl. 31:1) but its preservation is insufficient for identification with certainty.

Occurrence.—The specimen was found together with *Hemihoplites* sp. A in limestones of Polier Formation in the El Herete area. *Pseudothurmannia angulicostata* (d'Orbigny) is known from the Hauterivian and Barremian of France and Bulgaria.

Genus *Hemihoplites* Spath, 1924
Hemihoplites sp. A
(pl. 6:5)

Material.—One incomplete specimen with preserved fragment of body chamber and aperture (no. 2651a, b).

Dimensions: D—c. 63.0 mm; H—23.0 mm; O—28.0 mm; H/D—c. 0.36; O/D—c. 0.44.

Description.—Coiling evolute, whorls rectangular in cross-section, rapidly increasing in height and with flat sides. Umbilical wall steeply inclined, umbilicus wide and shallow. Inner whorls ornamented with thick, single straight ribs widening towards the venter and with some swellings at ventral margin. The ribs are sometimes united in pairs at umbilical margin. Constrictions, three to four per whorl, and small lateral thickenings are displayed by inner whorls. Ornamentation changes on outer whorl which is covered by more densely spaced and somewhat wavy ribs bifurcating close to ventral margin; the secondary ribs are markedly prorsiradiate. Body chamber a half of whorl long, with somewhat weaker ornamentation.

Remarks.—The ornamentation, shape and dimensions of shell suggest affiliation of the specimen with the genus *Hemihoplites* Spath, 1924 (Luppov 1958:102, pl. 46: 6a, b; Chapa 1963:30, pl. 30:3). At the same time the specimen markedly differs from the only species allocated by Spath in that genus, i.e. *Hemihoplites feraudinaus* (d'Orbigny) in ribs bifurcating and only occasionally converging in subumbilical zone.

Occurrence.—El Herete area, Polier Formation, Sierra del Rosario. The genus *Hemihoplites* Spath is known from the Barremian of France.

Family **Baculitidae** Meek, 1876
Genus *Bochianites* Lory, 1898
Bochianites sp.
(pl. 6:9)

Material.—Two poorly preserved specimens (no. 2616a and b).

Dimensions: 2616a—length—54.0 mm; width—5.5 mm.

2616b—length—33.0 mm; width—5.0 mm.

Remarks. — The preservation is insufficient for specific identification.

Occurrence. — Outcrop north of Soroa at bifurcation of roads to Cayajabos and El Brujito, limestones of Polier Formation, Sierra del Rosario. The genus *Bochianites* Lory, 1898, is known from the Valanginian of Crimea, Caucasus, Europe, Africa and India.

Genus *Hamulina* d'Orbigny, 1852
Hamulina cf. *astieriana* d'Orbigny, 1852
(pl. 6:7)

Material. — Three incomplete specimens (no. 2555, 2594, 2623).

Dimensions: no. 2594 — length of retroversum — 26.0 mm; distance between arms — 6.0 mm.

The preservation of remaining specimens precludes taking measurements.

Description. — Arms hook-like, retroversum somewhat diverging from pro-versum; whorl sides convex. Shell ornamented with wide ribs almost perpendicular to axis of arms. Inter-rib spaces narrow and moderately deep. Venter obscure.

Remarks. — The specimens undoubtedly belong to the genus *Hamulina* d'Orbigny, 1852. They are similar to *Hamulina astieriana* d'Orbigny figured by Drushtchits (1958:62, pl. 23:7) in shell shape and ornamentation but their preservation is unsatisfactory for identification with certainty.

Occurrence. — The specimen no. 2594 was found at Lomas de Polier and the specimen no. 2623 — at Casa Blanca, Polier Formation, and the specimen no. 2555 — at Quiñones — San Martín, Lucas Formation in Sierra del Rosario. *Hamulina astieriana* d'Orbigny is known from the Barremian of Crimea, Caucasus and western Europe.

? *Hamulina* sp.
(pl. 7:8)

Material. — One incomplete specimen (no. 2637).

Dimensions: Length of retroversum — 15.0 mm; width of retroversum — 6.0 mm; length of pro-versum — 26.0 mm; width of pro-versum — 4.0 mm; number of ribs on 15 mm section of retroversum — 11.

Remarks. — The coiling is typical of the genus *Hamulina* d'Orbigny, 1852. Pro-versum thin; ribs, as far as visible, slightly bent towards the retroversum in lower part. Retroversum subcircular in cross-section, ornamented with strong single ribs somewhat oblique in relation to the axis of retroversum. The specimen is similar in shape to that figured as *Hamulina parvula* sp. nov. by Sarasin & Schöndelmayer (1901:166, pl. 23:4, 5), differing in stronger sculpture. At the same time the preservation of sculpture (especially on pro-versum) is insufficient for identification with certainty.

Occurrence. — Casa Blanca locality, limestones of Polier Formation, Barremian, Sierra del Rosario.

Genus *Anahamulina* Hyatt, 1900
Anahamulina cf. *subcincta* Uhlig, 1883
(pl. 7:4)

Material. — Two incomplete specimens (no. 2632, 2639).

Dimensions: no. 2632 — length of specimen — 13.5 mm; width of retroversum — 5.0 mm; width of pro-versum — 4.0 mm; distance between arms — 1.5 mm; 9 single

ribs at 8 mm section of retroversum; 10 ribs at 10 mm section of proversum. no 2639 — length of specimen — 36.0 mm; width of retroversum — 8.0 mm; width of proversum — 6.0 mm; distance between arms — 7.0 mm.

Description. — Specimen no. 2632 is incomplete. Arms set parallel to one another; the distance between arms constant, equal about 1.5 mm. Both retroversum and proversum ornamented with fine ribs somewhat oblique to shell axis. Inter-rib spaces and ribs equal in width.

Specimen no. 2639 is also incomplete. Proversum somewhat bent towards the retroversum. Ornamentation of proversum obliterated. Retroversum somewhat bent, ornamented with markedly flattened blunt ribs. Maximum distance between ribs equal 7 mm, and the minimum — 4 mm.

Remarks. — The specimens are most close to *Anahamulina subcincta* Uhlig described by Sarasin & Schöndelmayer (1901:170, pl. 24:2) and Thomel (1964:66, pl. 10:3), somewhat differing in ornamentation and angle at which the arms are bent. The specimens are also similar to the holotype of *Anahamulina beskydensis* Vašíček (1972:62, pl. 8:1, fig. 20), differing on less numerous ribs.

Occurrence. — Casa Blanca locality, limestones of Polier Formation, Barremian, Sierra del Rosario. *Anahamulina subcincta* Uhlig is known from the Barremian of France, and *A. beskydensis* Vašíček — from the Upper Barremian of Czechoslovakia.

Anahamulina cf. *distans* Hohenegger, 1883
(pl. 6:8)

Material. — Two incomplete specimens (no. 2560, 2638).

Dimensions: no. 2638 — width of retroversum — 4.0 mm; width of proversum — 3.0 mm; distance between arms — 7.0 mm.

no. 2560 — width of retroversum — 4.0 mm; width of proversum — 3.0 mm; distance between arms — 18.0 mm; number of ribs per 1 cm section of proversum — 9.

Description. — Shell hook-like, arms set at the angle of about 40°; sides of arms convex, distance between arms gradually increasing. Proversum ornamented with numerous, moderately strong ribs somewhat oblique to its axis; inter-rib spaces twice wider than ribs. The ornamentation becomes weaker on retroversum which is covered with ribs set perpendicular to axis of the arm; width of ribs and inter-rib spaces somewhat increases on retroversum.

Remarks. — The specimens are similar to the representatives of *Anahamulina distans* Hohenegger, figured by Vašíček (1972:61, pl. 9:3, 4; pl. 15:4), differing in ornamentation, number of ribs and angle of bending of arms. The specimens are somewhat similar to that figured as *Crioceras (Leptoceras) heeri* Ooster by Sarasin & Schöndelmayer (1901:149, pl. 20:2, 3) which is also very close or even belongs to the above mentioned species.

Occurrence. — Lomas de Polier (specimen no. 2560) and Casa Blanca (specimen no. 2638) localities, limestones of the Polier Formation, Sierra del Rosario. *Anahamulina distans* Hohenegger is known from the Barremian of France and Czechoslovakia.

Genus *Ptychoceras* d'Orbigny, 1842
Ptychoceras cf. *morloti* Ooster, 1861
(pl. 6:6)

Material. — One specimen (no. 2642).

Dimensions: Length of retroversum — 15.00 mm; length of proversum — 23.0 mm;

maximum width of retroversum — 4.2 mm; maximum width of proversum — 3.0 mm; distance between arms — 0.5 mm.

Description. — Coiling of the ptychoceratic type. Proversum and retroversum ribbed; ribbing obliterated on the former; the latter is ornamented with about 12 ribs at 15 mm section. The arms are parallel and almost touching one another. Constrictions not noted.

Remarks. — The specimen is similar to *Ptychoceras morloti* Ooster described by Sarasin & Schöndelmayer (1901:174, pl. 25:3) and Vašíček (1972:65, pl. 10:4, 5) in shell shape and fine ribbing on both proversum and retroversum, differing in it from other species of this genus. The specimen somewhat differs from *P. morloti* Ooster in smaller inter-arm distance (0.5 mm) and denser ribs on retroversum. The preservation of the Cuban specimen is, however, insufficient for unequivocal specific identification.

Occurrence. — Casa Blanca locality, limestones of Polier Formation, Barremian, Sierra del Rosario. *Ptychoceras morloti* Ooster is known from the Upper Barremian and Lower Aptian of Czechoslovakia, Switzerland and Crimea.

Family *Olcostephanidae* Haug, 1910

Genus *Olcostephanus* Neumayer, 1875

Subgenus *Rogersites* Spath, 1924

Olcostephanus (Rogersites) cf. filifer Imlay, 1937

Material. — One whorl fragment (no. MRA-15a).

Remarks. — Whorl fragment about 40 mm high, ornamented with prominent tubercles somewhat above umbilical margin and 4-5 somewhat rectiradiate ribs diverging from every tubercle. The character of ornamentation is close to that of *Olcostephanus (Rogersites) filifer* Imlay (1937:559, pl. 73:1, 2; pl. 74:4, 5) but the preservation is insufficient for unequivocal assignation to that species.

Occurrence. — San Juan de Sagua-Mil Cumbres locality west of Sierra Chiquita, Lucas Formation, Sierra del Rosario. The subgenus *Rogersites* Spath, 1924 is known from the Upper Valanginian and Lower Hauterivian of Europe and Africa. *Olcostephanus (Rogersites) filifer* Imlay is known from the Upper Valanginian of Mexico.

Genus *Mexicanoceras* Imlay, 1938

Mexicanoceras cf. neohispanicum (Böse, 1923)

(pl. 7:2)

Material. — One flattened specimen (no. 2586a).

Dimensions: D — 24.0 mm; H — 13.0 mm; O — 4.5 mm; H/D — 0.54; O/D — 0.18.

Description. — Coiling moderately evolute; whorls overlapping one another in a quarter of height. Umbilicus narrow and deep. Ornamentation consisting of numerous ribs sharply bent towards the posterior and uniting in twos or threes close to umbilical margin; the point of confluence of ribs is sometimes emphasized by small umbilical tubercles.

Remarks. — The specimen is most close to *Mexicanoceras neohispanicum* (Böse) figured by Imlay (1938:566, pl. 7:22, 24, 28) in whorl shape, ornamentation and dimensions. It differs from *M. miembrense* Imlay (1938:564, pl. 7:12, 25—27) in smaller circumumbilical tubercles and generally weaker ornamentation.

Occurrence.—El Aguacatillo locality situated south of Quiñones, limestones of Polier Formation, Sierra del Rosario. *Mexicanoceras neohispanicum* (Böse) is known from the Upper Hauterivian of Mexico.

Family **Berriasellidae** Spath, 1922

Genus *Thurmanniceras* Cossmann, 1901

Thurmanniceras cf. *novihispanicum* (Imlay, 1937)

Material.—One incomplete specimen (no. 2665) and some whorl fragments.

Dimensions: D—about 47.0 mm; H—20.0 mm; O—12.0 mm; H/D—c. 0.42; O/D—c. 0.25.

Description.—Coiling involute. Whorl sides weakly convex. Umbilicus narrow and shallow. Ornamentation consisting of numerous somewhat prosoclinal, sharp-crested ribs bifurcating at ventral margin and passing through the venter with marked forward sweep.

Remarks.—The specimen is somewhat close to *Thurmanniceras novihispanicum* (Imlay) (Imlay 1937:563, pl. 78:8, 9, pl. 79:6) differing in ribs somewhat less bent at ventral margin and in slightly wider umbilicus (in the holotype H/D—0.43 and O/D—0.24). The specimens discussed here are insufficiently preserved for unequivocal assignment to the species. The species was initially described by Imlay (1937) under the generic name *Thurmannites* Kilian, 1913, at present considered as junior synonym of the name *Thurmanniceras* Cossmann, 1901 (see Dimitrova 1967:109).

Occurrence.—Bano quarry situated south of Soroa locality, Artemisa Formation, Sierra del Rosario. *Thurmanniceras novihispanicum* (Imlay) is known from the Valanginian of Mexico.

Genus *Kilianella* Uhlig, 1905

Kilianella pexiptycha (Uhlig, 1882)

(pl. 7:5)

1957. *Kilianella pexiptycha* (Uhlig); Arkell: 358, fig. 471—3a and 3b.

1967. *Kilianella pexiptycha* (Uhlig); Dimitrova: 119, pl. 50:5.

Material.—One specimen preserved in the form of mould (no. 2619).

Dimensions: D—c. 38.0 mm; H—12.0 mm; O—15.5 mm; about 20 umbilical ribs per a half of whorl; about 14 ribs at ventral margin at a quarter of whorl.

Remarks.—The dimensions and ornamentation of the specimen well agree with the diagnosis of *Kilianella pexiptycha* (Uhlig) (see Dimitrova 1967).

Occurrence.—Outcrop in the Serafino area north of Casa Blanca, ?Polier Formation limestones, Sierra del Rosario. *Kilianella pexiptycha* (Uhlig) is known from the Valanginian of France.

Family **Desmoceratidae** Zittel, 1895

Genus *Barremites* Kilian, 1913

Barremites (*Barremites*) cf. *difficilis* (d'Orbigny, 1840)

(pl. 7:6, 7)

Material.—Two poorly preserved specimens (no. 2582 and 2650).

Dimensions: no. 2650—D—39.0 mm; H—18.5 mm; O—7.0 mm; H/D—0.47; O/D—0.18; no. 2582—D—32.5 mm; H—16.0 mm; O—6.0 mm; H/D—0.49; O/D—0.18.

Description.—Coiling evolute. Whorls high, with flattened and smooth sides; whorls overlapping one another in one-third of height. Umbilical margin rounded. A small depression marked on whorl sides above the umbilical margin. Constrictions, about 6 in number per whorl, moderately deep.

Remarks.—The specimens are similar to *Barremites (Barremites) difficilis* (d'Orbigny) figured by Sarasin & Schöndelmayer (1901:52, pl. 5:8), Drushtchits (1957: 108, pl. 49:13), Fülöp (1958: pl. 8:6) and Baccelle & Garavello (1967:144, pl. 3:5, 6) in their shape, almost identical dimensions and in constrictions. However, their preservation is insufficient for assignation to that species with certainty.

Occurrence.—Specimen no. 2582—locality by the road from Soroa to Nuez, NE of Soroa, and specimen no. 2650—Loma Caldoso locality, the Cinco Pesos area, limestones of Polier Formation, Sierra del Rosario. *Barremites (Barremites) difficilis* (d'Orbigny) is known from the Hauterivian and Barremian of Crimea, Caucasus and other parts of Europe.

Family *Holcodiscidae* Spath, 1924

Genus *Spitidiscus* Kilian, 1910

Spitidiscus cf. *seunesi* (Kilian, 1888)

(pl. 7:1)

Material.—One specimen (no. 2563) preserved in the form of mould.

Dimensions: D—14.0 mm; H—5.0 mm; O—3.0 mm; H/D—0.35; O/D—0.21.

Description.—Coiling evolute. Whorls with convex sides and overlapping one another in a quarter of height. Umbilical wall almost vertical; umbilicus moderately shallow and wide. Ornamentation consisting of numerous fine, biplicate or, sometimes, triplicate ribs beginning at umbilical margin; point of furcation situated low on whorl side. Constrictions clearly marked on outer whorl, about 8 in number per whorl somewhat bent on umbilical wall and prosoclinal on whorl sides.

Remarks.—The specimen is similar to *Spitidiscus seunesi* (Kilian) described by Sarasin & Schöndelmayer (1901:46, pl. 5:1, 2), Drushtchits (1957: pl. 51:6) and Dimitrova (1967:152, pl. 78:17, 17a) differing in somewhat finer sculpture and dimensions. It differs from other species of that genus in ornamentation and dimensions.

Occurrence.—Lomas de Polier locality, Polier Formation, Sierra del Rosario. *Spitidiscus seunesi* (Kilian) is known from the Lower Barremian of Crimea and Bulgaria and Barremian of France.

Family *Pulchellidae* Douvillé, 1890

Genus *Pulchellia* Uhlig, 1883

Pulchellia cf. *favrei* Ooster, 1860

(pl. 8:3)

Material.—One specimen (no. 2606a).

Dimensions: D—23.0 mm; H—11.0 mm; O—3.0 mm; H/D—0.47; O/D—0.13.

Description.—Coiling evolute. Ornamentation partly obliterated, consisting of ribs beginning at umbilical margin, widening higher on whorl side and somewhat bending forward at ventral margin; some trend to uniting of the ribs in pairs close to the umbilical margin may be noted. Inter-rib furrows narrow and deep. Whorl sides weakly convex. Umbilicus narrow and deep, with vertical wall and rounded margin.

Remarks.—The specimen somewhat resembles *Pulchellia favrei* Ooster figured by Sarasin & Schöndelmayer (1901:25, pl. 3:1-8), differing in ribs bent stronger

especially in the ventral area. This feature brings the specimen close to *Pulchellia hoplitiformis* Sayan (see Dimitrova 1967:165, pl. 80:2). The specimen appears also similar to *Pulchellia (Hetteria) selecta* Gerhard figured by Bürgl (1956:70, pl. 15:3-7; pl. 16:1), from which it differs in ribs wider and more prorsiradiate close to the venter.

Occurrence.—Lomas de Polier locality, Polier Formation, Sierra del Rosario. The species with which the specimen was compared above are typical of the Barremian. According to Bürgl (1956) the stratigraphic range of the genus *Pulchellia* is limited to the Lower Barremian.

Genus *Nicklesia* Hyatt, 1903

Nicklesia cf. *dumasiana* (d'Orbigny)

(pl. 7:3)

Material.—One specimen (no. 2615).

Dimensions: D—about 24.0 mm; H—about 13.0 mm; O—2.2 mm; H/D—c. 0.54; O/D—c. 0.09.

Remarks.—Specimen incomplete. Whorl sides slightly convex. Umbilicus narrow, closed. Ornamentation consisting of coarse prorsiradiate ribs about 14 in number per a half of whorl. The specimen appears somewhat similar to *Nicklesia dumasiana* (d'Orbigny) figured by Bürgl (1956:48, pl. 7:1-5; pl. 8:1-8; pl. 9:2-6) in ornamentation and type of coiling, differing in somewhat more prorsiradiate and flattened ribs. The specimen is also somewhat similar to that described as *Pulchellia* sp. by Sarasin & Schöndelmayer (1901:30, pl. 3:14), differing in less numerous prorsiradiate ribs.

Occurrence.—Nortey (Casa Blanca) locality, Polier Formation, Sierra del Rosario. *Nicklesia dumasiana* (d'Orbigny) is known from the Lower Barremian of Columbia.

Family *Hoplitidae* Douvillé, 1890

Genus *Arrhaphoceras* Whitehouse, 1927

?*Arrhaphoceras* cf. *substuderi* Spath, 1926

(pl. 8:4)

Material.—One specimen (no. 2687), somewhat flattened.

Dimensions: D—39.0 mm; H—15.0 mm; O—13.0 mm; H/D—0.39; O/D—0.33.

Description.—Coiling involute. Specimen flattened, with ornamentation of inner whorls obliterated. Whorl sides weakly convex. Umbilicus wide, shallow, with rounded wall and margin. Strong ribs beginning somewhat below the umbilical margin and uniting into twos or threes at the margin; some single ribs were also noted. The point of confluence of ribs is emphasized by small circumumbilical tubercles. The ribs are somewhat weakened on whorl sides and end with strong tubercles at ventral margin.

Remarks.—The specimen is similar to that of *Arrhaphoceras substuderi* Spath figured by Renz (1968:31, pl. 2:20a, b, 21a, b and 22a, b; figs 11b, 12f) in thick, strong ribs united in twos or threes at umbilical margin and in circum-umbilical and ventral tubercles. It differs from the holotype of this species in somewhat lower whorls (dimensions of the holotype of *Arrhaphoceras substuderi* Spath according to Renz (1968:31) are: H—0.40; O—0.33). Moreover, the Cuban specimen is characterized by stronger development of tubercles from ventral margin and deeper constrictions especially well-visible in subapertural part whilst all the other features bring it close to the Spath's species.

Occurrence. — Loma Caldosó locality, Polier Formation, ?Upper Albian, Sierra del Rosario. *Arrhaphoceras substuderi* Spath is known from the Upper Albian.

Genus *Pleurohoplites* Spath, 1921

?*Pleurohoplites machini* sp.n.

(pl. 8:2)

Holotype: Specimen no. 2622, Inst. Geol. Paleont. Havana; pl. 8:2.

Type horizon: ?Upper Albian, Polier Formation.

Type locality: Mango Bonito, Sierra del Rosario, Pinar del Río province, western Cuba.

Derivation of the name: in honour of the late Bernardo Machin of the Institute of Geology and Paleontology of the Cuban Academy of Sciences, who found the specimen.

Material. — Holotype only.

Dimensions: D — 18.0 mm; H — 7.0 mm; O — 6.5 mm; H/D — 0.39; O/D — 0.36.

Diagnosis. — Coiling evolute; whorls subhexagonal in section; ribs prorsiradiate, biplicate and single; massive tubercles marked in the middle of inner whorls.

Description. — Specimen of medium size; coiling evolute, whorls subhexagonal in section, with sharpened ventral side; whorl sides initially convex, poorly convex later, converging towards the venter. Umbilicus wide and shallow, with moderately steep wall. Ornamentation consisting of coarse, single and biplicate ribs (the number of primary and secondary ribs per whorl equal 8 and 15, respectively) and strong tubercles (about 8 per whorl) marked in the middle of the last whorl. Ribs initially slightly and later markedly prorsiradiate. Tubercles initially marked in the mid-height, and subsequently shifted to the ventral margin finally they disappear in subperistomal zone. The ribs end on poorly marked elongate swellings on ventral margin. Suture line not visible.

Remarks. — The specimen presumably belongs to the genus *Pleurohoplites* Spath, 1921, as it is characterized by markedly prorsiradiate single and biplicate ribs, and development of 2 rows of tubercles (umbilical and those from ventral margin). At the same time it somewhat resembles the specimen figured as *Pleurohoplites* aff. *re-naurxianus* (d'Orbigny) by Renz (1968:44, pl. 5:15a, b) from which it differs in broader umbilicus, style of ornamentation and tubercles situated higher on whorl side. The latter feature, i.e. tubercles marked above umbilical margin brings the Cuban specimen close to the *Arrhaphoceras substuderi* Spath group (see Renz, 1968:31).

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DOLNOKREDOWE AMONITY SIERRA DEL ROSARIO (ZACHODNIA KUBA)

Streszczenie

W pracy został opisany dolnokredowy zespół amonitów znaleziony w Sierra del Rosario — regionie geologicznym położonym w zachodniej części Kuby (por. fig. 1). Amonity występują w dolnokredowych utworach formacji Artemisa, Polier i Lucas (por. figs 2—4). Utwory te składają się z szaro-niebieskich wapieni, łupków i piaskowców. W zespole amonitów wyróżniono 47 gatunków amonitów (pls 3—8), cztery gatunki wskazano jako nowe. Są to: *Crioceratites pinarensis*, *Karsteniceras polieri*, *Acrioceras (Paraspinoceras) rosariensis*, *?Pleurohoplites machini*. Oprócz amonitów znaleziono aptychy (*Lamellaptychus angulocostatus* Peters oraz małże z rodzaju *Buchia*). Zespół faunistyczny wskazuje na ?walanzyńsko-baremski wiek warstw.

Stwierdzono, że dolnokredowe amonity Sierra del Rosario wykazują pewne podobieństwo do zespołu dolnokredowych amonitów Meksyku i Kolumbii. Ponadto w zespole kubańskim stwierdzono występowanie amonitów zbliżonych do dolnokredowych amonitów Zachodniej Tetydy. Fakt ten posłużył autorowi do wyrażenia poglądu o istnieniu połączenia w dolnej kredzie pomiędzy basenem zachodniej Kuby a geosynkliną południowych Andów z jednej strony i obszarem Zachodniej Tetydy z drugiej.

РЫШАРД МЫЧИНСКИ

АММОНИТЫ НИЖНЕГО МЕЛА СИЕРРА ДЕЛЬ РОСАРИО
(ЗАПАДНАЯ КУБА)*Резюме*

В статье описана коллекция аммонитов нижнемелового возраста, найденных в Сиерра дел Росарио, геологическом регионе, расположенном в западной части Кубы (см. фиг. 1). Аммониты встречаются в толщах формаций Артемиса, Полиер и Лукас (см. фиг. 2—4). Эти толщи состоят из серо-голубых известняков, сланцев

и песчаников. Выделено 47 видов аммонитов (табл. 1—6), четыре вида были найдены впервые. Это: *Crioceratites pinarensis* sp. n., *Karsteniceras polieri* sp. n., *Actioceras* (*Paraspinoceras*) *rosariensis* sp. n., ?*Pleurohoplites machini* sp. n. Кроме аммонитов были также обнаружены аптихи (*Lamellaptychus angulocostatus* Peters), а также моллюски рода *Buchia*. Микрофауна и аммониты указывают на валанжиньско-баремский возраст отложений.

Установлено, что нижнемеловые аммониты Сиерра дель Росарио подобные аммонитам Мексики и Колумбии. Кроме того, в кубинской коллекции находятся аммониты похожие на нижнемеловые аммониты западной Тетиды. Это обстоятельство позволило автору сделать предположение о существовании в нижнемеловом периоде связи между западным бассейном Кубы и геосинклинали южных Анд, а также западной Тетиды.

EXPLANATION OF PLATES

All specimens are from the Lower Cretaceous of the Sierra del Rosario, western Cuba

Plate 3

1. *Vinalesites rosariensis* (Imlay): specimen no. 2537, $\times 2$. La Catalina.
- 2—5. *Protancyloceras hondese* (Imlay): 2 specimen no. 2542b, 3 specimen no. 2542a, 4 specimen no. 2664b, 5 specimen no. 2664c, all figures $\times 2$. 2542, a, b—La Zarza; 2664b, c—Loma del Rubi.
6. *Macroscaphites* cf. *yvani* (Puzos): specimen no. 2688, $\times 1$, 5. Loma Caldosos.

Plate 4

- 1, 3, 7. *Karsteniceras polieri* sp. n.: 1 specimen no. 2558 $\times 2$; 3 specimen no. 2569a, $\times 2$; 7 specimen no. 2556b (holotype). Lomas de Polier.
2. *Leptoceras* cf. *studer* (Ooster): specimen no. 2664, $\times 3$. Loma del Rubi.
4. *Protancyloceras* cf. *kurdistanense* Spath: specimen no. 2547, $\times 2$. La Catalina.
5. ?*Karsteniceras* cf. *subtilis* (Uhlig): specimen no. 2653c, $\times 2$. San Miguel.
6. ?*Leptoceras* (*Protoleptoceras*) cf. *jelevi* (Nikolov): specimen no. 2535a, $\times 2$. Sabamilla.
- 8—11. *Karsteniceras* sp.: 8 specimen no. 2649, $\times 2$; 9 specimen no. 2648b, $\times 2$; 10 specimen no. 2648d, $\times 2$; 11 specimen no. 2648, $\times 3$. El Herete.

Plate 5

- 1, 2. *Karsteniceras* sp.: 1 specimen no. 2648a, $\times 2$, 5; 2 specimen no. 2647, $\times 3$. El Herete.
3. ?*Karsteniceras* sp. B: specimen no. 668—98a, $\times 3$. Nortey (Casa Blanca).
- 4, 5. ?*Karsteniceras* sp. A: 4 specimen no 2635a₁, $\times 3$; 5 specimen no. 2635₂, $\times 3$. Nortey (Casa Blanca).
6. *Crioceratites pinarensis* sp.n.: specimen no. 2641 (holotype). Nortey (Casa Blanca).
7. *Crioceratites* sp. A: specimen no. 2625, $\times 1$, 5. Nortey (Casa Blanca).
8. ?*Crioceratites* sp.: specimen no. 2570, $\times 2$. Lomas de Polier.
9. *Paracrioceras* cf. *elegans* (Koenen): specimen no. 2668a, $\times 3$. San Miguel.
10. *Acrioceras* (*Acrioceras*) sp.: specimen no. 2559, $\times 2$. Lomas de Polier.

Plate 6

1. *Paracrioceras* cf. *elegans* (Koenen): specimen no. 2668b, $\times 3$. San Miguel.
2. *Acrioceras* (*Paraspinoceras*) *rosariensis* sp.n.: specimen no. 2574 (holotype), $\times 2$. NW of Soroa.
3. *Colchidites* cf. *colchicus* Djanelidze: specimen no. 2612, $\times 3$. Nortey (Casa Blanca).
4. ?*Moutoniceras* cf. *moutonianum* (d'Orbigny): specimen no. 2554, $\times 1.5$. Bracilano Rolle (Belén Vigoa).
5. *Hemihoplites* sp. A: specimen no. 2651a-b, $\times 1.5$. El Herete.
6. *Ptychoceras* cf. *morloti* Ooster: specimen no. 2642, $\times 3$. Nortey (Casa Blanca).
7. *Hamulina* cf. *asteriana* d'Orbigny: specimen no. 2623, $\times 3$. Nortey (Casa Blanca).
8. *Anahamulina* cf. *distans* Hohenegger: specimen no. 2638, $\times 3$. Nortey (Casa Blanca).
9. *Bochianites* sp.: specimen no. 2616a, $\times 2$. NW of Soroa.

Plate 7

1. *Spitidiseus* cf. *seunesi* (Kilian): specimen no. 2563, $\times 3$. Lomas de Polier.
2. *Mexicanoceras* cf. *neohispanicum* (Böse): specimen no. 2586a, $\times 2$. El Aquacatillo.
3. *Nicklesia* cf. *dumasiana* (d'Orbigny): specimen no. 2615, $\times 2$. Nortey (Casa Blanca).
4. *Anahamulina* cf. *subcincta* Uhlig: specimen no. 2639, $\times 2$. Nortey (Casa Blanca).
5. *Kilianella pexiptycha* (Uhlig): specimen no. 2619, $\times 1.5$. Serafino.
- 6—7. *Barremites* (*Barremites*) cf. *difficilis* (d'Orbigny): 6 specimen no. 2582, $\times 1.5$; 7 specimen no. 2650, $\times 1.5$. 2582 — NE of Soroa; 2560 — Loma Caldosos.
8. ?*Hamulina* sp.: specimen no. 2637, $\times 2$. Nortey (Casa Blanca).

Plate 8

1. *Lamellaptychus angulocostatus* (Peters): specimen no. 2686, $\times 3$. Lomas de Polier.
2. ?*Pleurohoplites machini* sp.n.: specimen no. 2622, $\times 2$. Mango Bonito.
3. *Pulchellia* cf. *favrei* Ooster: specimen no. 2606a, $\times 2$. Lomas de Polier.
4. ?*Arrahaphoceras* cf. *substuderi* Spath: specimen no. 2687, $\times 1.5$. Loma Caldosos.
5. *Partschiceras infundibulum* (d'Orbigny): specimen no. 2629, $\times 2$. Casa Blanca.
- 6—7. *Buchia* sp.: 6 specimen no. 2644, $\times 2$; 7 specimen no. 2645, $\times 3$. La Catalina.



1



6



2



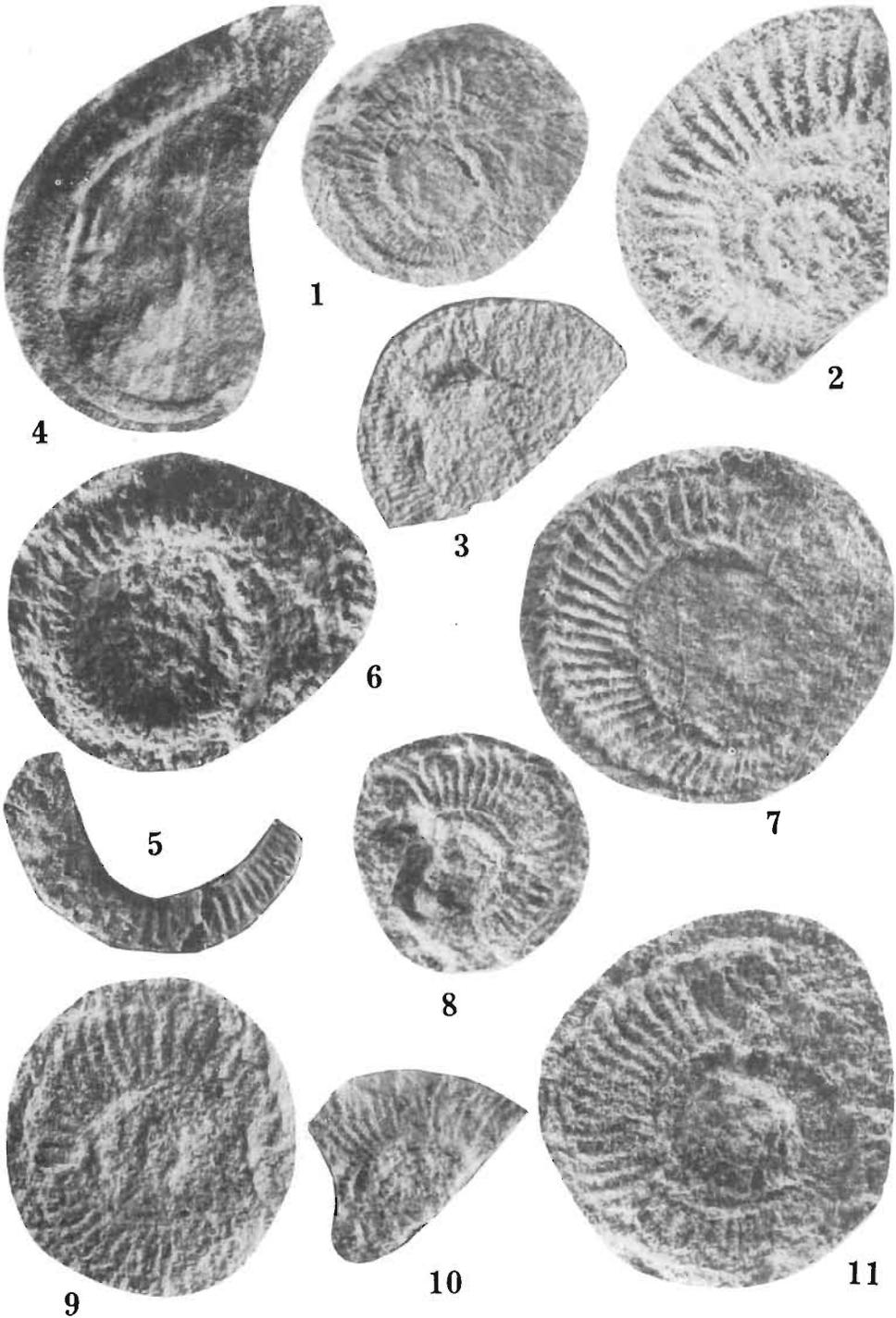
3



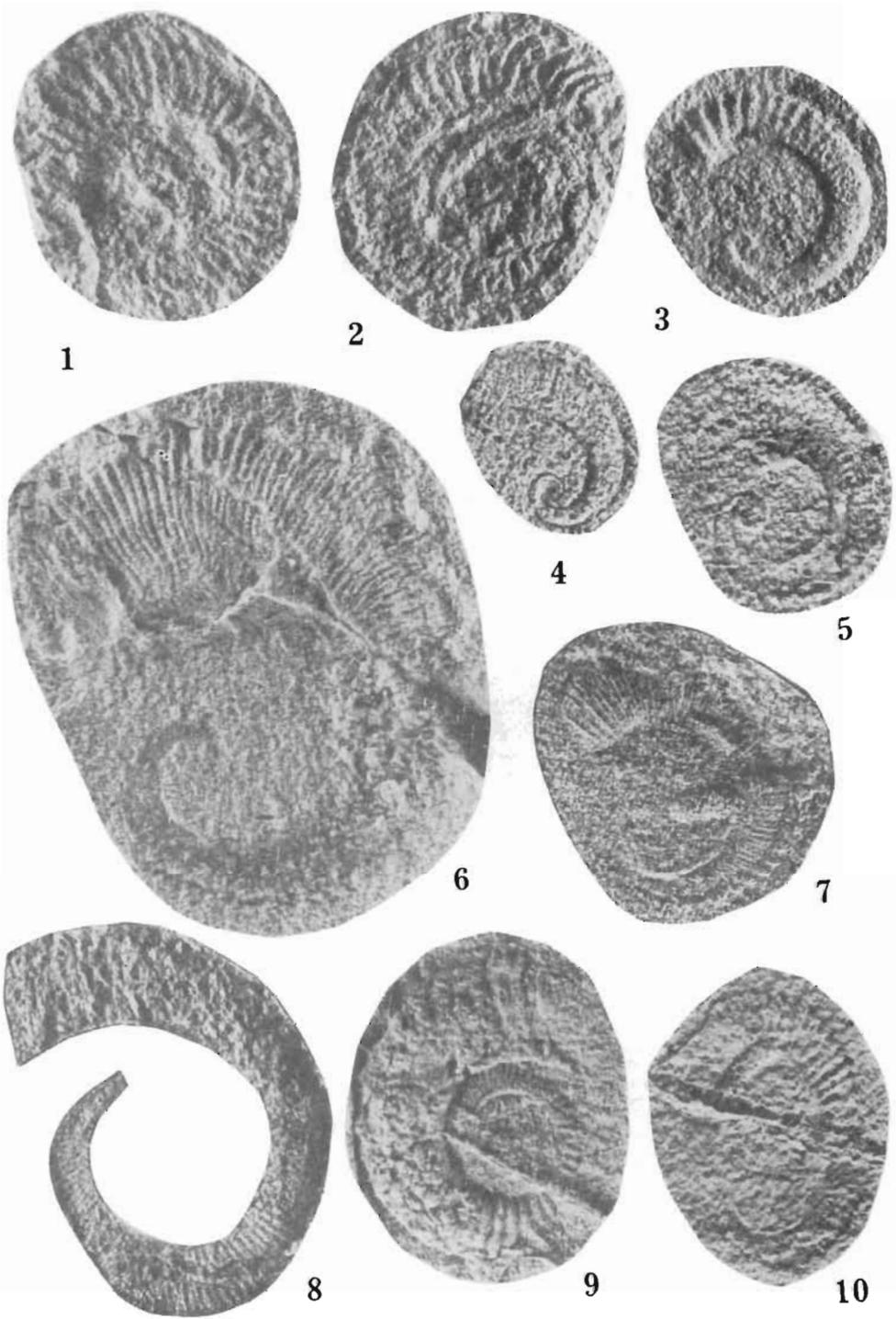
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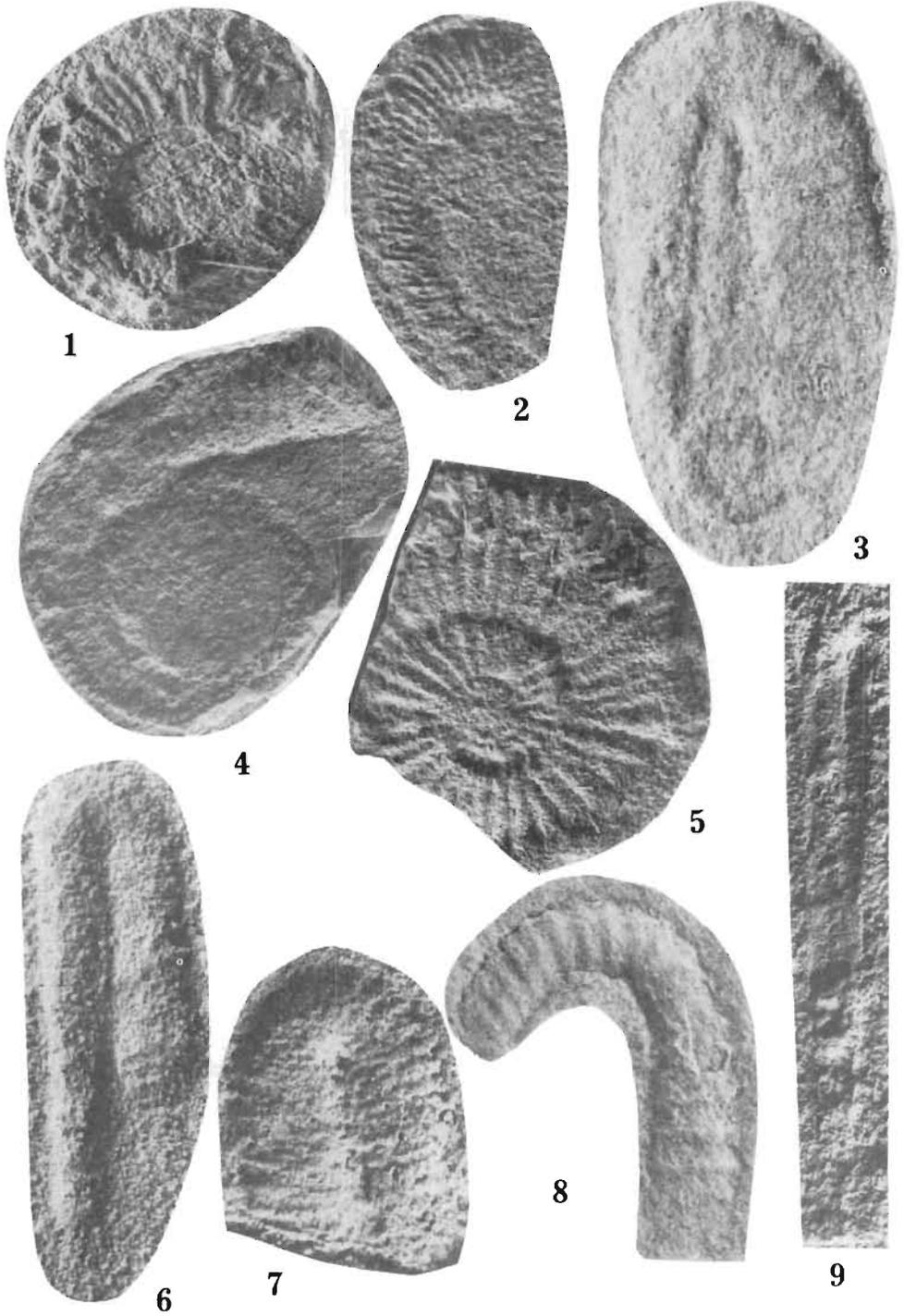
5



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