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The ammonites and age of the San Cayetano Formation from the Sierra del Rosario, western Cuba

ABSTRACT: The first ammonites recorded from the San Cayetano Formation of the Sierra del Rosario (western Cuba) are assigned to the genus *Perisphinctes*, indicating that the upper part of the formation is of Oxfordian age. In the investigated assemblage, established is a new ammonite species, *Perisphinctes (?Dichotomosphinctes) cayetanensis* Myczyński, sp. n. A comparison with the ammonite-bearing Francisco Formation shows that the uppermost part of the San Cayetano Formation is of Middle Oxfordian age.

INTRODUCTION

The age of the San Cayetano Formation from the Sierra del Rosario in western Cuba has hitherto been unknown as no guide fossils have been reported from these monotonous terrigenic deposits. The majority of authors assumed that this formation comprises the Lower and Middle Jurassic only (Furrazola-Bermúdez & al. 1964; Hatten 1967; Khudoley 1967; Judoley & Furrazola-Bermúdez 1968, 1971; Khudoley & Meyerhoff 1971; Meyerhoff & Hatten 1974) whereas others (Herrera 1961, Pszczółkowski 1971) suggested that the sedimentary sequence of the formation completed in early Late Jurassic.

In the course of field works in Pinar del Rio Province in March 1975 the authors found some ammonites in the upper part of the San Cayetano Formation, 4.5 km SE of La Palma (= Consolación del Norte) in the Sierra del Rosario. The collected ammonites were identified by R. Myczyński, who is responsible for their systematic description.

OCCURRENCE SITES

The majority of ammonites were found in three outcrops (No. *1*—*3*), south of Mogote Simón (*cf.* Fig. 1) in the La Paloma tectonic unit, and a single specimen in locality No. *4*, about 1 km S of El Burén in the El Mameyal tectonic unit (Fig. 1). The material available comprises 4 relatively complete ammonite casts and 11 whorl fragments.

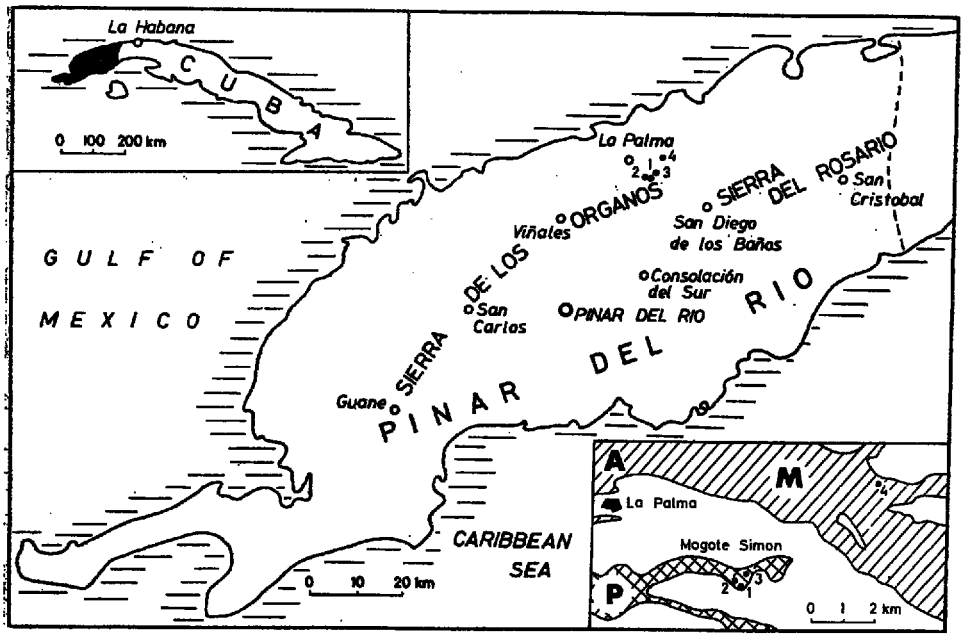

Fig. 1. Investigated faunistic localities (*1*—*4*) of the San Cayetano Formation in the Pinar del Rio Province (inset shows its position in Cuba)
1*A* Situation of the ammonite-bearing localities (*1*—*4*) near La Palma
San Cayetano Formation in separate tectonic units: *M* El Mameyal, *P* La Paloma & Loma del Puerto; younger deposits (Jurassic through Palaeogene) are marked by blank areas

The ammonites in locality No. *1* were derived from deposits of the San Cayetano Formation occurring a few meters above a tectonic contact of the formation and serpentinite (Fig. 2). They were identified as *Perisphinctes (?Dichotomosphinctes) cayetanensis* Myczyński sp. n., *P. (?Dichotomosphinctes)* cf. *anconensis* Sánchez Roig and *Perisphinctes* sp. They occur only on the surface of non-calcareous, mudstone concretions attaining a few to over a dozen cm in size and yelding finely dispersed iron compounds. The concretions occur in argillaceous shales with siltstone and fine-grained sandstone intercalations. The unit of concretion-bearing shales is 2 m thick, and is overlaid by 20 m unit of sandstones and shales of the same formation. The analysis of the geological setting, including the strike and dip of the strata, had shown that the ammonites were found 35 to ?100 m below the top of the formation.

The ammonites found in locality No. *2*, situated 150 m of the former, occurred in mudstone concretions embedded in shales. They were identified as *Perisphinctes (?Dichotomosphinctes)* cf. *anconensis* Sánchez Roig, *P. (Discosphinctes)* cf. *pichardoi*

Chudoley & Furrazola-Bermúdez and *Perisphinctes* sp. The shales are overlaid by a unit of sandstones and shales similar to that from locality No. *1*. The concretion-bearing shales from localities No. *1* and *2* presumably represent the same lithological unit.

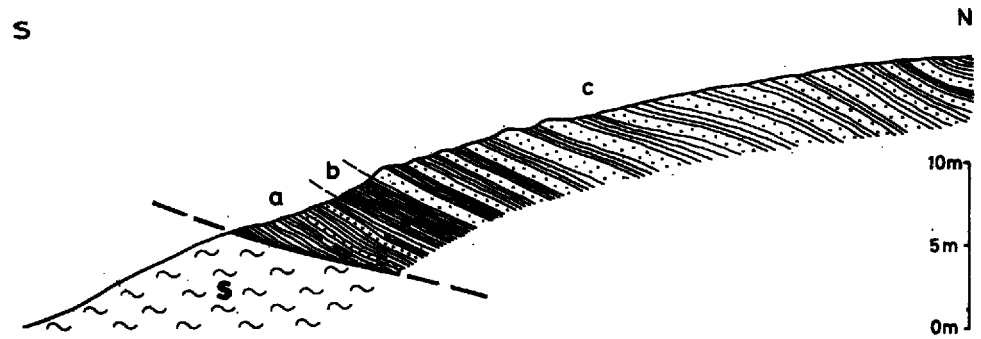

Fig. 2. Cross-section at locality No. *1*, south of the Mogote Simón
S serpentinite; a, b, c — San Cayetano Formation: *a* argillaceous shales with thin intercalations of sandstones, and with abundant plant detritus, *b* argillaceous shales with ammonite-bearing mudstone nodules, *c* fine-grained sandstones and argillaceous shales

In locality No. *3* (Fig. 1) the authors found a single cast of *Perisphinctes (?Dichotomosphinctes)* cf. *anconensis* Sánchez Roig on the surface of a concretion. The unit of shales with mudstone concretions here exposed is 14 m thick. The shales are overlaid by sandstone-shaly unit 25 m thick and the deposits of the Francisco Fm. (Fig. 3). The Francisco Fm. is a new lithostratigraphic unit, recently established by Pszczółkowski (*in* Kutek & al. 1976). The authors found the ammonites of the genera *Mirosphinctes* Schindewolf, 1926, and *Euaspidoceras* Spath, 1931, in the sediments of that formation exposed in the nearby part of the Mogote Simón section.

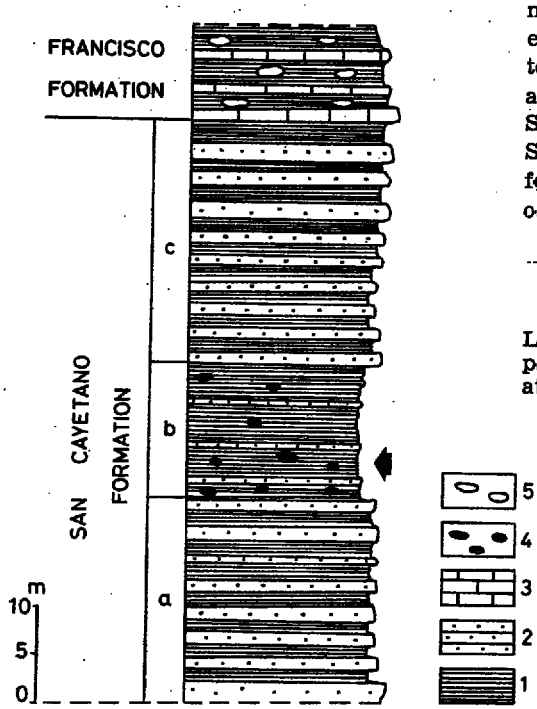

Fig. 3
Lithological column of the uppermost part of the San Cayetano Formation, at hillfoot of the Mogote Simón (locality No. *3*)
1 argillaceous shales, *2* sandstones and siltstones, *3* limestones, *4* mudstone nodules, *5* calcareous concretions
a, b, c — lithological units: *a* sandstones with shale intercalations, *b* argillaceous shales with mudstone nodules; arrowed is the occurrence site of *Perisphinctes (?Dichotomosphinctes)* cf. *anconensis* Sánchez Roig, found in a nodule, *c* sandstones with shale intercalations and abundant plant detritus

A single ammonite, identified as *Perisphinctes* sp., was found in locality No. 4. The ammonite occurred in a concretion embedded in shaly horizon 5 m thick, a few meters below a unit of micritic limestone intercalating terrigenous deposits of the upper part of the San Cayetano Fm.

STRATIGRAPHIC CONCLUSIONS

The horizons of argillaceous shales with concretions that locally bear ammonites occur 35 to (?) 100 m below the top of the San Cayetano Fm. The field works have shown that there are at least a few such horizons of mudstone-concretion bearing shales within terrigenous sediments in the investigated tectonic units of the Sierra del Rosario. The correlation of these horizons is usually precluded by strong tectonic deformations and poorly exposed sections.

The ammonites derived from the upper part of the San Cayetano Fm. exclusively represent the genus *Perisphinctes* Waagen, 1869. The identified taxa, *P. (?Dichotomosphinctes) cayetanensis* Myczyński sp. n., *P. (?Dichotomosphinctes)* cf. *anconensis* Sánchez Roig, *P. (Discosphinctes)* cf. *pichardoi* Chudoley & Furrazola-Bermúdez and *Perisphinctes* sp., indicate Oxfordian age of the discussed strata. In the Sierra del Rosario a somewhat younger ammonite assemblage, of Middle Oxfordian age, is known from the Francisco Fm. (*cf.* Wierzbowski 1976, Myczyński 1976). The ammonites found in that formation exposed in the Mogote Simon section, and belonging to the genera *Mirosphinctes* Schindewolf and *Euaspidoceras* Spath, in other sections of the formation occur directly above the Middle Oxfordian ammonite assemblage comprising *Vinalesphinctes* and other genera (*cf.* Wierzbowski 1976). It therefore appears that the uppermost part of the San Cayetano Fm. represents the Middle Oxfordian.

The discussed stratigraphic data suggest the Oxfordian age of a large part of the San Cayetano Fm. directly underlying the ammonite-bearing strata. The thickness of the Oxfordian deposits of that formation may be considerable and, in the present authors' opinion, it is not excluded that the whole formation in the Sierra del Rosario is of the post-Lower Jurassic age.

Up to the present no ammonites were found in shaly-sandstone sequence of the San Cayetano Fm. in the Sierra de los Organos. The ammonites described by Nuez (1972, 1974) from shales cropping out near the Mogote Zacarías are of Oxfordian age; according to Wierzbowski (1976), these shales should be assigned to the lowermost part of the Jagua Fm. The occurrence of Middle Oxfordian ammonites in the lowermost part of that formation (Wierzbowski 1976) indicates that the uppermost part of the San Cayetano Fm. from the Sierra de los Organos is also of Oxfordian age as there is a sedimentary continuity between these two formations (*cf.* Wierzbowski 1976).

AMMONITE FAUNA

The specimens collected represent only the external casts. All the specimens are housed in the Paleontological Museum of the Institute of Geology and Paleontology, Cuban Academy of Sciences, La Habana.

In descriptions the following abbreviations are used: D_t — maximum diameter of specimen (in mm), D — diameter at which the measurements are taken (in mm), h — whorl height, u — umbilical diameter, Wh — whorl height/diameter ratio, Ud — umbilical diameter/diameter ratio, NR — number of ribs per whorl.

Family **Perisphinctidae** Steinmann, 1890
Genus *PERISPHINCTES* Waagen, 1869
?Subgenus *DICHOTOMOSPHINCTES* Buckman, 1926
Perisphinctes (?Dichotomosphinctes) cayetanensis Myczyński, sp. n.
(Pl. 1, Figs 1—2; Pl. 2, Fig. 1)

Holotype: specimen No. *5059*, figured in Pl. 1, Fig. 1.

Type horizon: upper part of the San Cayetano Fm., argillaceous shales with concretions.

Type locality: 450 m S of the Mogote Simón; coordinates: x = 241,470, y = 324,100; Consolación del Notre (La Palma) sheet, Pinar del Río province, Cuba.

Derivation of the name: from the San Cayetano Fm.

Paratype: specimen No. *5060*, figured in Pl. 2, Fig. 1.

Material. — Two specimens (5059 and 5060) as well as three others fragmentarily preserved and assigned to the species tentatively (5060a, 5060b, 5060c).

Dimensions:

Specimen No.	Dt	D mm	h mm	u mm	Wh	Ud
5059 holotype	65.0	62.0	16.0	30.0	.25	.48
5060	-	40.0	10.0	21.0	.25	.50

Description. — Coiling evolute, whorl section ellipsoidal to subrectangular, whorl sides convex, umbilical margin rounded, umbilical wall somewhat convex, umbilicus wide, shallow. Outer whorl embracing the inner up to one-sixth of its height. Ribs strong, fairly densely spaced, 25 and 22 in number per half of whorl at 60 mm and 30 mm diameter, respectively (cf. Fig. 4). Ribs originating at umbilical whorl, passing the umbilical margin with slight forward twist, prorsiradiate or, sometimes, flexuous on whorl sides, dividing into two somewhat weaker secondary ribs close to rounded ventral margin. Single(?) ribs occasionally occur. Inner whorl display distinct oblique constrictions, 5 in number per whorl. Suture line obscure.

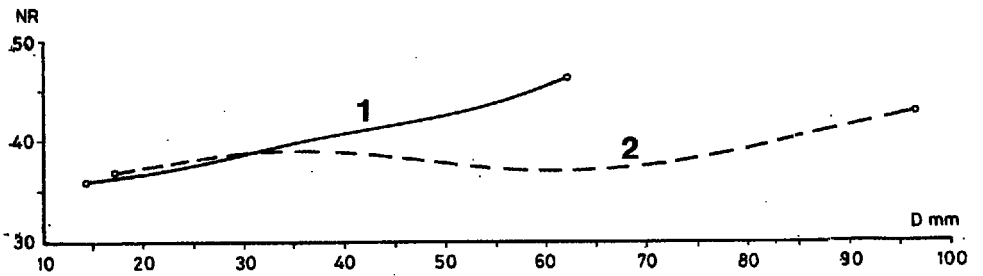

Fig. 4. Rib curves of: *1* holotype of *Perisphinctes* (*?Dichotomosphinctes*) *cayetanensis* Myczyński, sp. n., *2* specimen No. *JF-78* illustrated by Judoley & Furrazola-Bermúdez (1968, pl. 40, fig. 2)

Remarks. — The investigated specimens somewhat resemble *Perisphinctes plicatiloides* O'Connell known from the Jagua Fm. of the Sierra de los Organos, but they differ rom the holotype (*cf.* O'Connell 1920, p. 670, Pl. 36, Figs 1–2) by their more numerous and stronger ribs and somewhat more involute coiling. The specimens also resemble one of those assigned to *Perisphinctes (Dichotomosphinctes) plicatiloides* O'Connell by Judoley & Furrazola-Bermúdez (1968, Pl. 40, Fig. 2, specimen No. J.F.-78), differing in less involute coiling and denser spacing of ribs (*cf.* Fig. 4).

The species *Perisphinctes plicatiloides* O'Connell was recently revised by Wierzbowski (1976) who assigned it in a newly proposed subgenus *Antilloceras*. The specimens from the San Cayetano Fm. are incomplete and it is not possible to recognize the features typical of that subgenus. The specimens display some diagnostic features of the subgenus *Dichotomosphinctes* Buckman (*cf.* Enay 1966) and they are allocated in the latter tentatively.

Occurrence. — Locality No. *1*, upper part of the San Cayetano Fm.

Perisphinctes (?Dichotomosphinctes) cf. *anconensis* Sánchez Roig, 1951
(Pl. 1, Fig. 3; Pl. 2, Fig. 2)

Material. — Two poorly preserved specimens (No. *5062* and *5063a*).

Dimensions:

Specimen No.	D mm	h mm	u mm	Wh	Ud
5062	≈58.0	≈18.0	28.0	≈.31	≈.48
5063a	≈35.0	12.0	15.0	≈.34	≈.42

Description. — Coiling evolute, with wide, shallow umbilicus. Whorl sides slightly convex. Outer whorl embracing the inner one up to one-third of its height. Ornamentation consisting of numerous, thin, prorsiradiate ribs, about 15 in number per a quarter of whorl, bifurcating close to the ventral side. Constrictions poorly visible.

Remarks. — The specimens are somewhat similar to that distinguished as *Perisphinctes anconensis* by Sánchez Roig (1951, p. 73, Pl. 20, Figs 1–2) from the Jagua Fm. of the Sierra de los Organos. They are, however, poorly preserved for an unequivocal identification.

Occurrence. — The area of the Mogote Simón, localities No. *1* (specimen No. *5063a*) and *3* (specimen No. *5062*); upper part of the San Cayetano Fm.

Subgenus *DISCOSPHINCTES* Dacqué, 1914
Perisphinctes (Discosphinctes) cf. *pichardoi* Chudoley & Furrazola-Bermúdez, 1968
(Pl. 2, Fig. 3)

Material. — A single incomplete specimen (No. *5061*).

Dimensions:

Specimen No.	D mm	u mm	Ud	NR
5061	≈50.0	21.0	≈.42	44

Description. — Coiling moderately involute; whorl sides flattened. Umbilicus wide, shallow. Ornamentation consisting of numerous thin, mainly bifurcate ribs

beginning at umbilical margin with a slight forward twist, prorsiradiate on whorl sides and bifurcating close to ventral margin. Single ribs occasional. Constrictions weak, about 4 in number per a half of whorl.

Remarks. — The specimen somewhat resembles the holotype of *Perisphinctes (Discosphinctes) pichardoi* Chudoley & Furrazola-Bermúdez (1968, p. 100, Pl. 58, Figs 1–2) described from the Jagua Fm.

Occurrence. — Locality No. *2*, upper part of the San Cayetano Fm.

Perisphinctes sp.

Material. — One more complete (No. *6P-0216*) and three fragmentary specimens (No. *5063b, 5063c, 5063d*).

Remarks. — The more complete specimen (No. *6P-0216*), about 40 mm in size, is characterized by coiling close to the involutness/evolutness boundary (Wh = *c.* 0.37, Ud = *c.* 0.40). The remaining specimens seem to be moderately evolute. All of them display biplicate ribs, and the point of rib furcation is situated close to the ventral side. The specimens belong to the genus *Perisphinctes*, but their preservation is insufficient for any more detailed identification.

Occurrence. — Localities No. *1* (specimens No. *5063c, 5063d*), No. *2* (specimen No. *5063b*) and No. *4* (specimens No. *6P-0216*); upper part of the San Cayetano Fm.

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LOS AMMONITES Y LA EDAD DE LA FORMACIÓN SAN CAYETANO EN LA SIERRA DEL ROSARIO, CUBA OCCIDENTAL

(Resumen)

Se presenta la descripción de los ammonites encontrados en la parte superior de la Formación San Cayetano en la Sierra del Rosario (Fig. 1). Los ammonites ocurren 30 hasta 100 (?) metros debajo del tope de la formación (Fig. 2 y 3). Los ammonites pertenecen al género *Perisphinctes* Waagen. En la fauna estudiada (Lam. 1 y 2) fuè establecida la especie nueva *P. (?Dichotomosphinctes) cayetanensis* Myczyński, sp. n. (Fig. 4; Lam. 1, Fig. 1—2 y Lam. 2, Fig. 1). Los ammonites indican sin dudas la edad Oxfordiano de las capas que los contienen. Estas capas no pueden ser más jovenes que el Oxfordiano Medio, porque ocupan la posición litoestratigrafica màs baja que la Formación Francisco (Oxfordiano Medio). La edad de la parte más alta de la Formación San Cayetano en la Sierra del Rosario se encuentra probablemente dentro de los límites del Oxfordiano Medio.

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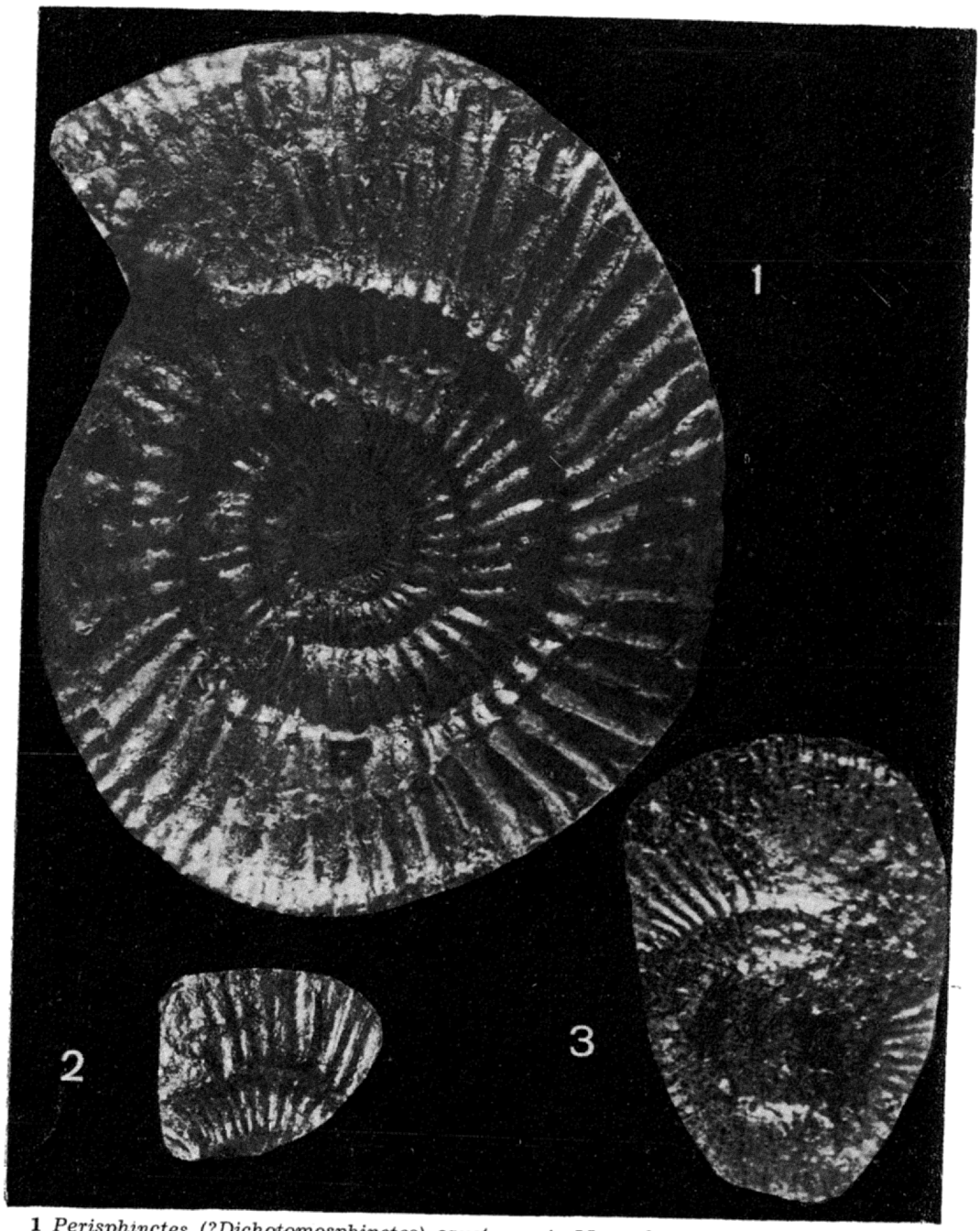
AMONITY I WIEK FORMACJI SAN CAYETANO W SIERRA DEL ROSARIO, ZACHODNIA KUBA

(Streszczenie)

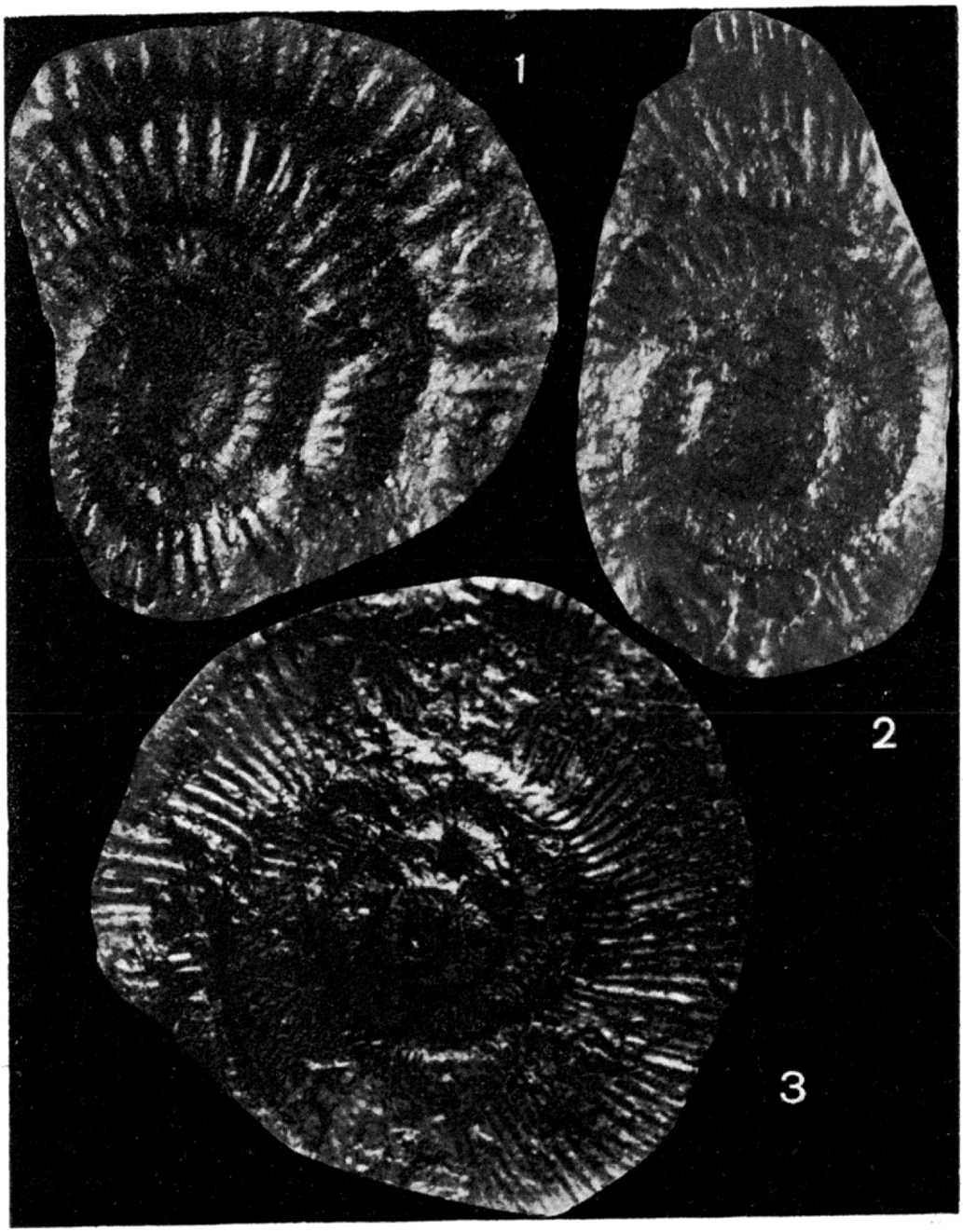
Przedmiotem pracy jest opis fauny amonitowej znalezionej w górnej części formacji San Cayetano w Sierra del Rosario w zachodniej Kubie (*por.* fig. 1—3). Wszystkie zebrane amonity (*por.* pl. 1—2) należą do rodzaju *Perisphinctes* Waagen, przy czym w badanym zespole wyróżniony został gatunek nowy, *P. (?Dichotomosphinctes) cayetanensis* Myczyński, sp. n. (*por.* fig. 4; pl. 1, fig. 1—2, oraz pl. 2, fig. 1). Opisane amonity wskazują, iż wiek najwyższej części formacji San Cayetano mieści się w obrębie oksfordu środkowego.



1 *Perisphinctes (?Dichotomosphinctes) cayetanensis* Myczyński, sp. n.; specimen No. 5059 (holotype) × 1.8

2 *Perisphinctes (?Dichotomosphinctes)* cf. *cayetanensis* Myczyński, sp. n.; specimen No. 5060a, nat. size

3 *Perisphinctes (?Dichotomosphinctes)* cf. *anconensis* Sánchez Roig; specimen No. 5062, × 1.8



1 *Perisphinctes (?Dichotomosphinctes) cayetanensis* Myczyński, sp. n.; specimen No. 5060 (paratype), × 1.8

2 *Perisphinctes (?Dichotomosphinctes)* cf. *anconensis* Sánchez Roig; specimen No. 5063a, × 1.8

3 *Perisphinctes (Discosphinctes)* cf. *pichardoi* Chudoley & Furrazola-Bermúdez; specimen No. 5061, × 1.8