

**UPPER CAMPANIAN – LOWER MAASTRICHTIAN
PACHYDISCUS FROM THE PENDERISCO
FORMATION, WESTERN CORDILLERA
(ANTIOQUIA – COLOMBIA)**

***PACHYDISCUS* DEL CAMPANIANO
SUPERIOR – MAASTRICHTIANO INFERIOR
DE LA FORMACION PENDERISCO, CORDILLERA
OCCIDENTAL (ANTIOQUIA – COLOMBIA)**

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Díaz-Cañas, J., S.; Patarroyo P., (2014). *Upper Campanian – lower Maastrichtian Pachydiscus from the Penderisco Formation, Western cordillera (Antioquia–Colombia)*. GEOLOGIA COLOMBIANA, Vol.39. Bogotá, Colombia. pp.15-22

Manuscrito recibido: 25 de Enero de 2014; aceptado: Septiembre de 2014

Resumen

Las amonitas cretácicas de Colombia han sido estudiadas extensamente, sin embargo, solo unos pocos registros han sido descritos para la cordillera Occidental. En este trabajo se está reportando la presencia de *Pachydiscus* (*P.*) cf. *flexuosus* en cercanías a Giraldo (Antioquia-Colombia). Durante el trabajo detallado de reconocimiento de campo, realizado entre los municipios de Santa Fé de Antioquia y Cañasgordas (Antioquia), se obtuvo el material paleontológico. El único ejemplar recobrado *in situ* fue hallado dentro de una concreción calcárea, ubicada en la base de la Formación Penderisco. De acuerdo con este nuevo dato bioestratigráfico, se puede indicar, para el segmento más bajo de la Formación Penderisco, un rango estratigráfico entre el Campaniano superior y el Maastrichtiano inferior.

Palabras Clave: *Pachydiscus*, cordillera Occidental de Colombia, Formación Penderisco, Campaniano-Maastrichtiano

Abstract

Cretaceous ammonoids from Colombia have been studied extensively. However, only a few records have been reported from the Western Cordillera so far. Here, we reported the occurrence of *Pachydiscus* (*P.*) cf. *flexuosus* near to the Giraldo village in the Antioquia Province (Colombia). The paleontological material was recovered during an extensive geological survey carried on around the towns of Santa Fé de Antioquia and Cañasgordas. The single specimen recovered was found in a calcareous concretion located *in situ* at the base of the Penderisco Formation. This new biostratigraphic data suggest an upper Campanian to lower Maastrichtian range for the lowest part of the Penderisco Formation in the area.

Keywords: *Pachydiscus*, Western Cordillera of Colombia, Penderisco Formation, Campanian-Maastrichtian

INTRODUCTION

Upper Cretaceous ammonoid assemblages are well known from high latitudes of the northern hemisphere (cf. Kennedy, 1986, Odin & Lamaurelle, 2001, Walaszczyk *et al.* 2001), however, they are relatively scarce in tropical and subtropical regions, especially in northern South America (Etayo-Serna, 1964, 1994, Stinnesbeck *et al.* 2012).

The Penderisco Formation includes the Urrao Member with sandstones and mudstones, and the Nutibara

Member with limestones and cherts (Alvarez & Gonzalez, 1978). The fossil record of the Penderisco Formation is scarce. Etayo-Serna (1989) reported the occurrence of the ammonoid *Nostoceras* and the bivalve *Trochoceras* in turbiditic beds of the Urrao Member. Its stratigraphic distribution range from the upper Campanian to the lower Maastrichtian (Etayo-Serna, 1989). Bourgois *et al.* (1987) and Duque-Caro (1989) described the microfossil fauna of the Nutibara Member and assigned an upper Cretaceous to Paleocene age.

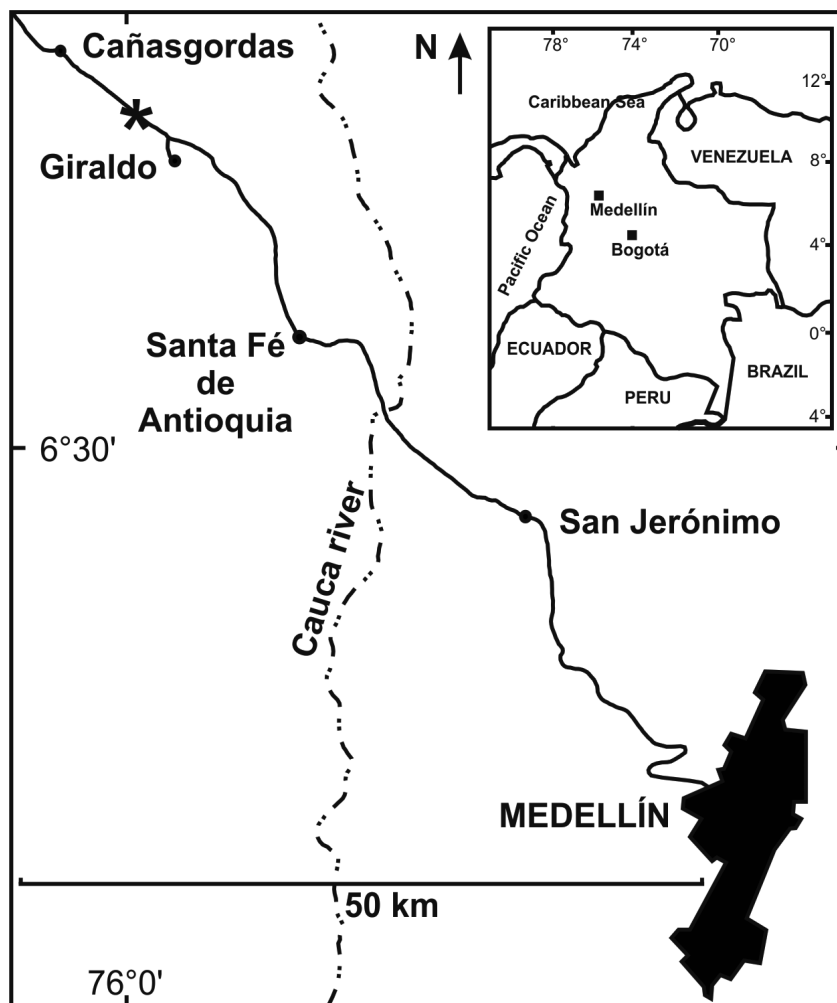


Figure 1. Localization area of the Santa Fé de Antioquia – Cañasgordas section (Antioquia Province).

Here, we report the occurrence of the *Pachydiscus* in the Urrao Member of the Penderisco Formation. This ammonoid record in sediments of the Western Cordillera constrains the stratigraphic position between the upper Campanian and lower Maastrichtian to the lower part of the studied succession, and makes possible local and probably global-scale correlations.

GEOLOGICAL FRAMEWORK

The Cañasgordas Group was proposed by Alvarez (1971) to describe ocean-affinity successions located to the West of the Romeral Fault, in Northwest of the Antioquia Province (Colombia). This group was later subdivided into the Barroso and Penderisco formations by Alvarez & Gonzalez (1978).

The Barroso Formation is a volcano-sedimentary succession, comprising basalts and tuffs, interbedded with sedimentary rocks, generally very thin layers of black marls and dark-gray biomicrites, which represent Albian to lower Coniacian ages (Etayo-Serna *et al.* 1980, Mejía & Salazar, 1989).

The Penderisco Formation is subdivided into two members (Alvarez & Gonzalez, 1978), the Urrao Member, which comprises turbiditic sandstones and mudstones, and the Nutibara Member, comprising limestones and cherts. The geological unit overlaying the Nutibara Member comprises dark-gray and silt-sandy sediments known as the Limolitas del Sireno Formation (González & Londoño, 2003).

The palentological material described in this study was recovered from a very thick bed of sandy limestone with concretions that include other mollusk fragments. This bed is located at the base of the Penderisco Formation and rest uncomformably over basaltic lavas of the Barroso Formation (Figures 1 and 2).

SYSTEMATIC PALEONTOLOGY

The systematic follows mainly Wright *et al.* (1996).

Phylum: Mollusca

Class: Cephalopoda Leach, 1817

Order: Ammonoidea Zittel, 1884

Suborder: Amonitina, Hyatt, 1889

Superfamily: Desmocerataceae Zittel, 1895

Family: Pachydiscidae, Spath 1922

Genus: *Pachydiscus* Zittel, 1884

Subgenus: *Pachydiscus* Zittel, 1884

Type species: *Ammonites neubergicus* HAUER, 1858

Pachydiscus (Pachydiscus) cf. flexuosus MATSUMOTO

Figure 2. Figure 3a-c. Figure 4.

MATERIAL

One internal mould of phragmocone and body chamber. N.º UN-DG-AM-242, from the lower part of the Penderisco Formation (Giraldo, Antioquia-Colombia). The fossil material is kept at the paleontological collections of the Departamento de Geociencias de la Universidad Nacional de Colombia - Sede Bogotá.

Measurements (in mm). Figures in brackets are percentages of whorl diameter. UN-DG-AM-242. (D=

Diameter, Wh= whorl height, Wb= whorl breadth, Ud =umbilical diameter).

D= 53,4; Wh= 29,4 (0,55); Wb= 22,6 (0,423); Wb/Wh= 0,769; Ud = 3,7 (0,256).

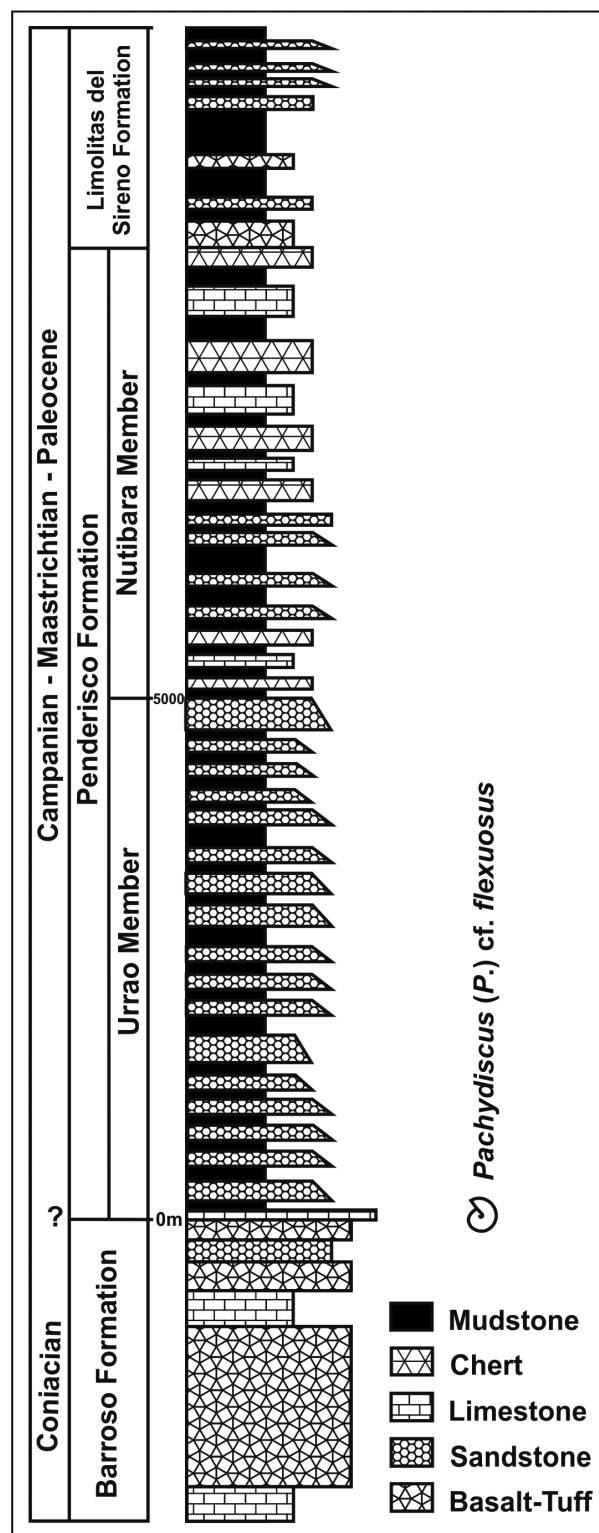


Figure 2. Stratigraphic succession of the Cañasgordas Group, the fossil was found at the base of the Penderisco Formation.

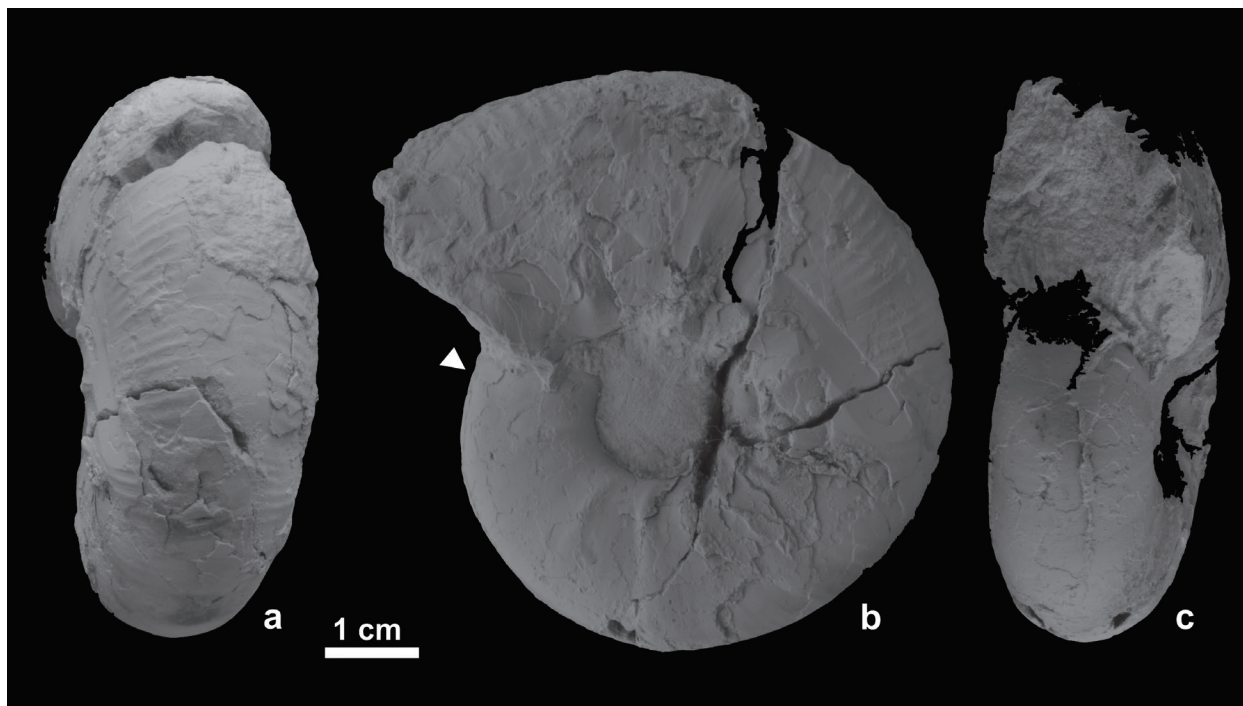


Figure 3. Illustration of *Pachydiscus* (*Pachydiscus*) cf. *flexuosus*. UN-DG-AM-242. a. back view. b. lateral view. c. frontal view. Scale bar 1 cm.

DESCRIPTION

An almost complete calcite-replaced exemplar, in which the internal mould and the shell can be partly seen. The size of the shell is moderate, subinvolute, with narrow umbilicus (0,256%) according to Korn (2010), and the whorl section is moderate, ovalated, and higher than wide, slightly compressed, rounded venter. The greatest whorl breadth located near the umbilical border.

The ornamentation consists of rounded umbilical, relatively thick and separated ribs resembling very elongated bullae and with a slightly rursiradiated tendency, which vanish towards the mid flank, 11 bullae per whorl. From the middle part of the last whorl and since the middle flank are fine and regular ribs, they are slightly curved towards the ventral zone, where they continue without interruption. The umbilical wall is rounded. The body chamber collapsed at one side, while the phragmocone is preserved in volume.

The suture line of *Pachydiscus* (*P.*) cf. *flexuosus* MATSUMOTO (Figure 4) is very characteristic with the incised ventral lobe and the incised lateral saddle (cf. Hauer 1858, pl. 2, Figure 3).

DISCUSSION

The examined specimen presents two rib sets; one characterized by thick ribs towards the umbilical border

and lower flank, and other by thin ribs that tend to disappear towards the flank, and having rounded flanks. These characteristics are consistent with the ribbing pattern of the genus *Pachydiscus* from Zittel (1884). Although *Pachydiscus* is considered a cosmopolitan genus (Wright *et al.* 1996), the new data reported here represent the second occurrence of this genus in Colombia (Pardo-Trujillo *et al.* 2004).

Matsumoto *cf. et al.* (1979, p. 57) described similar ornaments in specimens of *P. (P.) egertoni* (Forbes 1846, pl 9 1), since in the illustration radially elongated tubercles like bullae from the umbilical border until the middle part of the flank can be seen. Other ornaments cannot be described at the interspaces between these bullae, like in the colombian exemplar. *P. (P.) egertonianus* (Forbes) and *P. (P.) cricki* (Kossmat) in Kossmat (1898, pl. XV (3 and 4) show the periumbilical bullae; while the secondary ornaments are very thick or they are just growth lines. *P. (P.) oldhami* (Sharpe) in Kennedy (1986, fig. 16, pl. 5, figure 1-3) and in Wiedmann & Schmidt (1993, figure 5 (5) illustrated the periumbilical bullae and rectiradiate ribs with ventral convexity, although can be “effacing” over the flank.

P. (P.) gutierrezzi Salazar, Stinnesbeck & Quinzio-Sinn in Salazar *et al.* (2010), is different to our exemplar, since the primary ribs are longer and continuous, besides the secondary ribs are thicker and more spaced, just like *P. (P.) jacquoti chilensis* in Stinnesbeck (1986, pl. 13-8). *P. (Parapachydiscus) fascicostatium* Yabe in Yabe &

Shimizu (1921, pl. II (2) shows thin primary ribs, which reach the middle high part of the flank. In contrast with the Colombian specimen, they are more numerous per whorl and tend to be rectiradiated.

P. (P.) excelsus Matsumoto in Matsumoto *et al.* (1979) has ribs with a rectiradiate tendency, differing to the

rursiradiated ribs tendencies of the colombian specimen. Finally, *P. (P.) flexuosus* Matsumoto in Matsumoto *et al.* (1979, pl. 9, figure 1-3), *P. flexuosus* Matsumoto in Maeda *et al.* (2005, figure 14 (2, 5) and Maeda & Shigeta (2005, figure 8), with fine and regular rursiradiated and slightly curved ribs, resembles the colombian specimen.

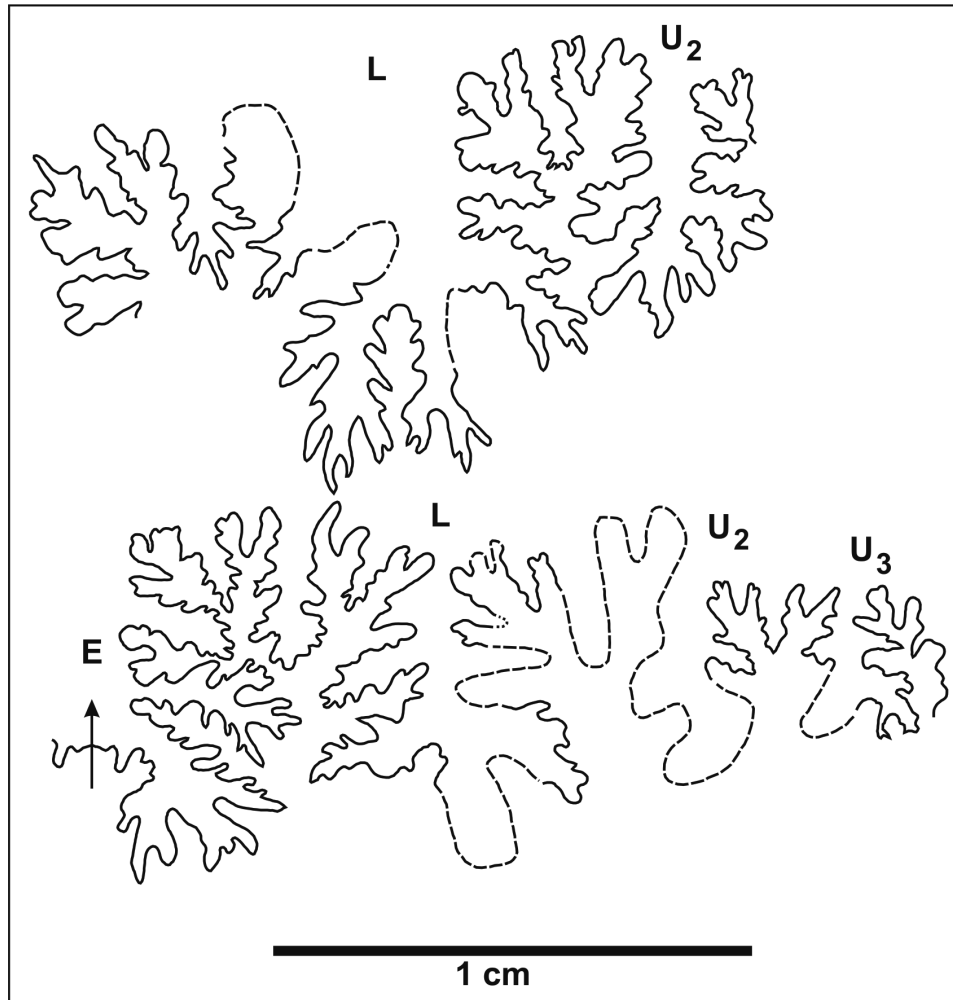


Figure 4. Suture line of *Pachydiscus (Pachydiscus) cf. flexuosus*. UN-DG-AM-242.

RANGE

P. (P.) flexuosus has been indicated to represent the lower part of the upper Maastrichtian (Maeda & Shigeta 2005, p. 126) and the Maastrichtian (Shigeta *et al.* 2005, p. 120) at the Makarov area, Sakhalin Oblast, Russia. At the Hokkaido region, where the first exemplar of *P. (P.) flexuosus* was recovered, the stratigraphic range of the species is Campanian to Maastrichtian (Matsumoto in Matsumoto *et al.* 1979).

We argue that the Colombian material reported here represents the upper Campanian - lower Maastrichtian.

This range is indicated by mollusk fossils previously recovered from the Penderisco Formation (Etayo-Serna 1989).

CONCLUSIONS

We reported a new occurrence ammonoid material from the Western Cordillera of Colombia. According to the revision of published descriptions and illustrations, we identify the single specimen as *Pachydiscus (Pachydiscus) cf. flexuosus*. The fossil material was recovered from the lowest part of the Penderisco

Formation. This species ranges from upper Campanian to lower Maastrichtian in both Japan and Russia. (Matsumoto *et al.* 1979).

ACKNOWLEDGEMENTS

We like to thank Alexis Rojas (Division of Invertebrate Paleontology, Florida Museum of Natural History) for his careful and constructive review of the manuscript.

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