

THE TITHONIAN (UPPER JURASSIC) AMMONITE SUCCESSION AT PORTADA COVUNCO, NEUQUÉN-MENDOZA BASIN, ARGENTINA

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Abstract.- The Tithonian rock succession (Vaca Muerta Fm.) of Portada Covunco consists of a lower part of little more than 100 m of shales and shaly limestones with ammonites of the genera "*Lithacoceras*", *Choicensisphinctes* and *Pseudolissoceras* of the Mendozanus and Zitteli zones; the middle part consists of about 160 m of limestones and marly limestones with ammonites of the genera *Aspidoceras* and *Catutosphinctes* of the Proximus? and Internispinosum zones; ending with some 45 m of unfossiliferous mudstones and shaly marls. *Catutosphinctes* Leanza & Zeiss (Ataxioceratidae: Torquatisphinctinae), a genus widely distributed through all the Tithonian of the southern Neuquén-Mendoza Basin, occurs through the more calcareous upper part of the section, mainly the type species *Catutosphinctes rafaeli* Leanza & Zeiss.

Key-words: Argentina, Neuquén-Mendoza Basin, Tithonian, Stratigraphy, Ammonites, *Catutosphinctes*.

Resumen.- La sucesión de amonites tithonianos en Portada Covunco, Cuenca Neuquén-Mendoza, Argentina.

La sucesión de rocas tithonianas (Fm. Vaca Muerta) de Portada Covunco consiste de una parte inferior de poco más que 100 m de pizarras y calizas o margas pizarrosas con amonites de los géneros "*Lithacoceras*", *Choicensisphinctes* y *Pseudolissoceras* de las zonas Mendozanus y Zitteli; una parte media de unos 160 m de calizas y calizas margosas con amonites de los géneros *Aspidoceras* y *Catutosphinctes* de las zonas Proximus? e Internispinosum; culminando con unos 45 m de limolitas y margas pizarrosas sin fósiles. *Catutosphinctes* Leanza & Zeiss (Ataxioceratidae: Torquatisphinctinae), un género ampliamente distribuido en todo el Tithoniano de la cuenca, se presenta en todo el tramo calcáreo superior de la sección, principalmente su especie tipo *Catutosphinctes rafaeli* Leanza & Zeiss.

Palabras clave: Argentina, Cuenca Neuquén-Mendoza, Tithoniano, Estratigrafía, Amonites, *Catutosphinctes*.

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INTRODUCTION

Portada Covunco is a locality of the southern part of the Neuquén-Mendoza Basin in which the upper Jurassic is well exposed. This locality belongs to the Geological Sheet 35b – Zapala, which was described in detail by Lambert (1956). There are no published reports of the local section measured in detail with ammonites collected bed-by-bed, probably due to the scarce ammonite fauna. It is interesting to note that all the Upper Jurassic of the studied locality has yielded very scarce and poorly preserved ammonites, the exception being the lower Tithonian in which the fossils are also poorly preserved but somewhat more abundant.

During field-work for the study of the Upper Jurassic ammonite fauna and biostratigraphy of the basin, it was made a detailed survey, measuring the section and sampling ammonites through the Vaca Muerta Formation in the outcrop located close to the bridge of Route 22 over the Arroyo Covunco, right margin (Fig. 1). In this paper are described the rock succession and the few middle Tithonian ammonites collected. The lower Tithonian ammonites are not yet studied in detail but they are closely comparable with those of Cerro Lotena and Picún Leufú (see Parent et al. 2006).

STRATIGRAPHY

The Tithonian outcrop in Portada Covunco belongs to the lower and middle parts of the Vaca Muerta Fm. and consists of more than 300 m of calcareous sediments overlying the conglomerates of the Tordillo Fm. These rocks of the Vaca Muerta Fm. are poorly fossiliferous, especially the middle part formally named Los Catutos Member (Leanza & Zeiss 1990: 173). The measured section is described in detail below and summarized in Fig. 2; from top:

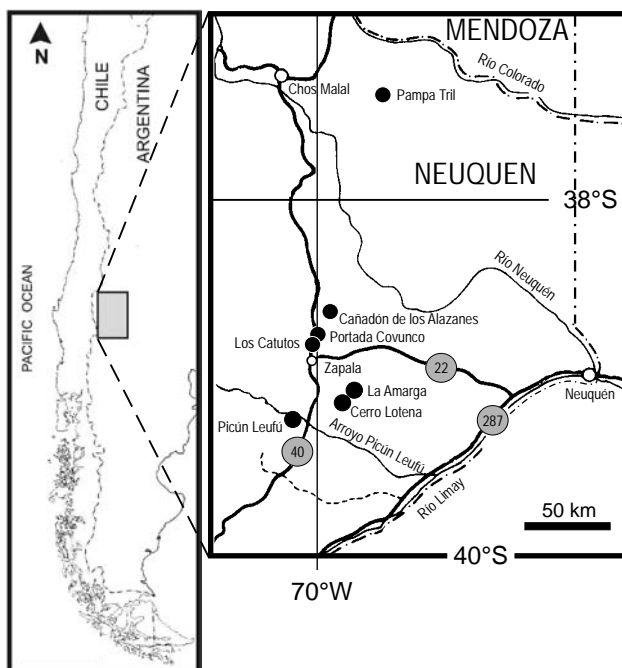


Figure 1. Reference map of the southern Neuquén-Mendoza Basin showing the localities cited in text.

Vaca Muerta Fm.

-Soil cover-

Bed PC-17: about 10 m visible, reddish brown shales, micaceous. No fossils.

Bed PC-16: about 20 m, hard nodular brownish mudstone with gypsum. No fossils.

Bed PC-15: 15 m, reddish brown shales, micaceous. No fossils.

Bed PC-14: 104 m, very homogeneous, gray marly limestone with large calcareous concretions. Ammonites abundant but sparsed throughout the thickness of the bank, crushed, showing no concentrations at specified levels, always outside the concretions: *Catutosphinctes rafaeli* Leanza & Zeiss, 1992 [M&M] and *Catutosphinctes cf. araucanense* (Leanza, 1980) [M]; impressions of larger ammonites are visible on weathered surfaces.

-Covered-

Bed PC-13: 0.50 m, gray shaly marl. No fossils.

-Covered-

Bed PC-12: 0.42 m, dark gray marly limestone with conchoidal fracture; large concretions. Weathered surface whitish gray. Moderately large and scarce, crushed ammonites: *Catutosphinctes rafaeli* [M] and *Catutosphinctes cf. araucanense* [M].

-Covered-

Bed PC-11: 0.30 m, sandy limestone, gray to whitish in fresh. No fossils.

Bed PC-10: 1 m, light gray marly limestone with conchoidal fracture. No fossils.

Bed PC-9: 4.90 m, yellowish gray marly limestone, nodular; yellowish weathered surface. No fossils.

Bed PC-8: about 1 m, light gray marly limestone, nodular, with conchoidal fracture. Scarce and poorly preserved crushed ammonites: *Catutosphinctes* sp.

Bed PC-7: about 1 m, yellowish gray marly limestone. Bivalves.

Bed PC-6: 39 m, light gray marly limestone, nodular, with conchoidal fracture. Scarce and poorly preserved crushed ammonites: *Catutosphinctes* sp.

Bed PC-5: 15.6 m, gray marly limestone, nodular. Scarce and poorly preserved, crushed ammonites: *Catutosphinctes* sp. and *Aspidoceras* sp. [M] (loose).

-Covered-

Bed PC-4: 52 m, shaly marl, gray to dark gray, with abundant small nodules in bands. The basal band of nodules conform a level with abundant aptychi (*Lamellaptychus*), *Pseudolissoceas zitteli* (Burckhardt, 1903) [M] and *Choicensisphinctes* sp.

Bed PC-3: about 0.50 m, gray marly to finely sandy limestone with calcareous concretions. From this bed come fragments of large specimens of *P. zitteli* [M] and *Choicensisphinctes* sp., into concretions which can be collected loose in the field, showing the ammonites by weathering; scarce minute gastropods.

Bed PC-2: 48 – 52 m, poorly exposed. Above, greenish gray marly limestones. Middle part, gray and orange limestones. At base, shaly marls with ammonites poorly preserved, mostly crushed: "*Lithacoceras*" n. sp. aff. *malarguense* (in Parent et al. 2006) and *Choicensisphinctes cf. windhauseni* (Weaver, 1931).

Bed PC-1: about 1 m, black marly limestone with crushed perisphinctid ammonites.

-Covered-

Tordillo Fm., several meters of coarse, brown conglomerates.

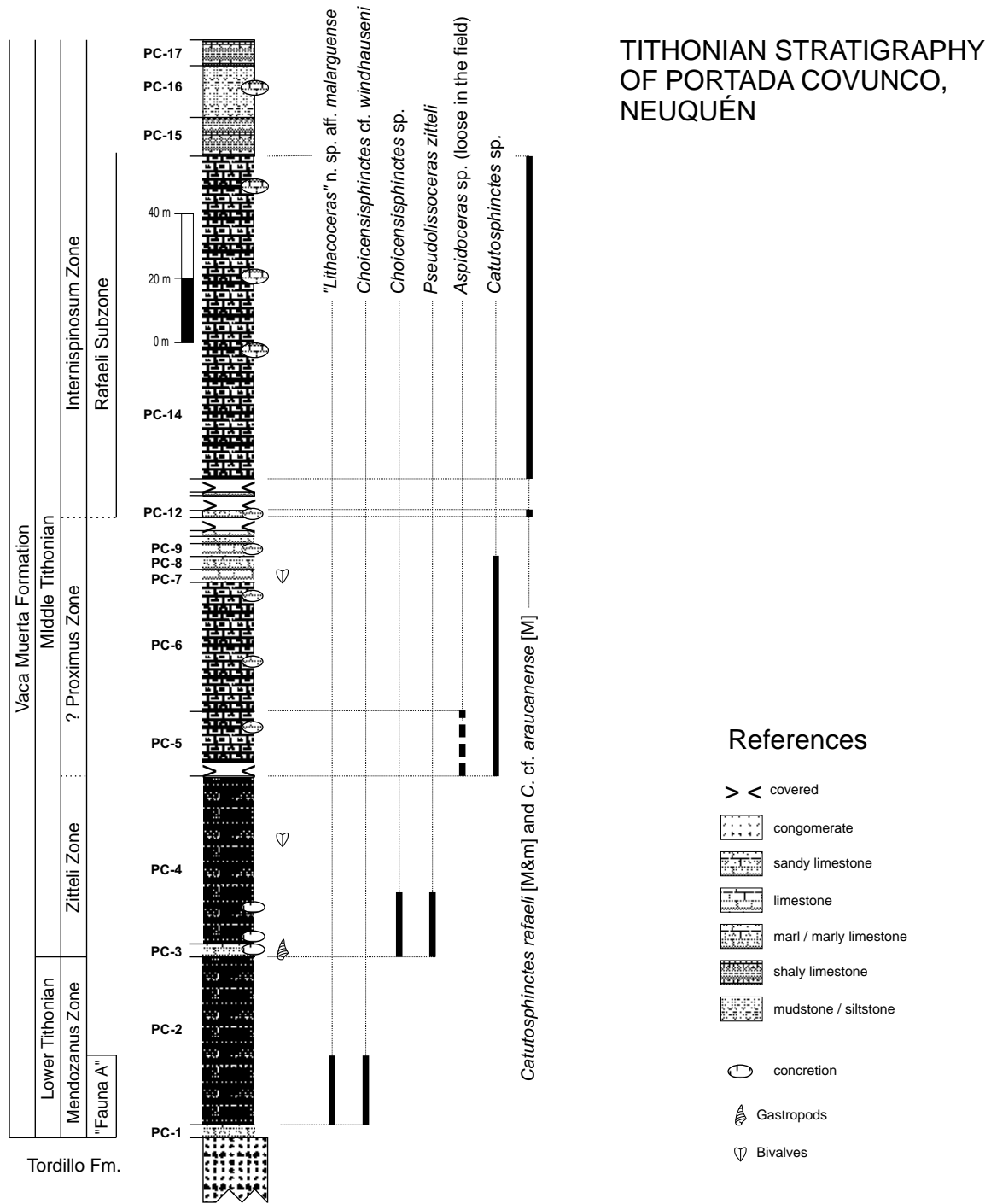


Figure 2. Log-section of the Tithonian Vaca Muerta Formation in Portada Covunco and distribution of the ammonite fauna. Chronostratigraphic subdivision (zonation) explained in text.

The close locality Los Catutos, situated about 4 km SW of Portada Covunco (Fig. 1), was studied by Leanza & Zeiss (1990, 1992). Its stratigraphy is very similar to that of Portada Covunco and may be taken as reference. In the mentioned papers, Leanza & Zeiss concluded that the lithographic limestones of the middle Tithonian of the area were deposited under shallow open marine conditions, in a protected area at about 100 km out of the coast. The outcrop of Portada Covunco represents the northernmost extension of the depositional device Los Catutos, towards deeper positions of the basin, as can be seen in Cañadón de los Alazanes (see Parent 2001). The

rock and ammonite successions are almost identical. Main differences seem to be the poorer fauna and larger silt fraction in the carbonates of Portada Covunco (beds PC-4 – PC-14) respect Los Catutos (beds x, x+a, y, z and w of Leanza & Zeiss 1990: fig. 4). Bed PC-5 (Fig. 2 this paper) is nearly equivalent to bed x+a, bed PC-6 with bed x, and beds PC-8 to PC-14 with beds y-z-w.

SYSTEMATIC PALEONTOLOGY

The specimens studied are housed at the Museo Prof.

Oslacher, Zapala (MOZP). Macroconch females are indicated as [M] and microconch males as [m].

Order Ammonoidea Zittel, 1884
Suborder Ammonitina Zittel, 1884
Superfamily Perisphinctoidea Steinmann, 1890
Family Ataxiceratidae Buckman, 1921
Subfamily Torquatisphinctinae Tavera, 1985

Remarks.- The subfamily is mainly conformed by the Indo-malgasian lineage *Torquatisphinctes* Spath, 1924 – *Katrolicerias* Spath, 1924 – *Pachysphinctes* Dietrich, 1925, and can be added with confidence the genus *Catutosphinctes* Leanza & Zeiss, 1992, as a separate Andean lineage (see Parent 2003). The widely cited European (Sub-Mediterranean) “*Torquatisphinctes*” belong to another genus, probably unrelated phyletically (G. Schweigert, pers. comm. 2005; A. Scherzinger pers. comm. 2005)

Genus *Catutosphinctes* Leanza & Zeiss, 1992

Type species: *Catutosphinctes rafaelli* Leanza & Zeiss, 1992 by OD

Remarks.- *Catutosphinctes* includes the Andean Tithonian succession of species listed in Parent (2003: 158), formerly under *Torquatisphinctes*, *Katrolicerias* and *Pachysphinctes*. This lineage has been confirmed after bed-by-bed collections during last years throughout the southern Neuquén-Mendoza Basin. There is a dense succession of chronospecies (under current study) which shows the evolution of forms whose record begins with the Early Tithonian *Catutosphinctes* cf. *mendozanus* (Burckhardt, 1911, in Parent et al. 2006: fig. 3C-D) up to the late Middle Tithonian *Catutosphinctes americanensis* (Leanza, 1980). The lineage ranges up into the Late Tithonian with at least one species of *Catutosphinctes* to which belongs the specimen described as “*Berriasella fraudans* (Steuer, 1897) var. *inflata* n. var.” by Leanza (1945: pl. 1: 1), barely distinguishable from the middle Tithonian forms close to *Catutosphinctes proximus* (Steuer, 1897).

***Catutosphinctes rafaelli* Leanza & Zeiss, 1992**

Fig. 3A-G

Material.- Ten specimens, mostly crushed, macro- and microconchs from beds PC-12 and PC-14.

Remarks.- Present macroconchs (Fig. 3D-G) are identical with the phragmocone of the holotype, the umbilical width about a half of diameter, 20-23 primaries per half whorl which divide, in the middle or upper third of the flank, into two or three secondaries after a reinforcement or elevation on the point of furcations. This latter feature is typical of the genus and is conspicuous throughout all the lineage. Adult bodychamber has paired-collared ribs (Fig. 3G). This feature is also characteristic of the genus, and seems to occur for first time in macroconchs of the upper Proximus Zone or lower Internispinosum Zone in Cerro Lotena. The microconchs of the present species are figured for first time. Adult microconchs are less than a half in size than their adult macroconchs; ribbing consists of an alternation of simple and bifurcate primary ribs (cf. Leanza & Zeiss 1992: 1849), with the bifurcation point on mid-

flank and showing the reinforcement or elevations in the furcation point; umbilical width is always about a half of the diameter in adult stage. The peristome has a pair of mid-lateral lappets, they are short, wider at base, ending on a rounded edge, their length is a half of the whorl height on their basal portion. The bodychamber of microconchs is about 0.7 whorl long, shorter than in macroconchs which is about 0.8 – 1.0 whorl long.

BIOSTRATIGRAPHY

The chronostratigraphic classification of the Andean Tithonian adopted is modified from Leanza (1981) as discussed in Parent et al. (2007). The zones used throughout all the text are non-standard chronostratigraphic zones which can involve gaps or overlaps at their boundaries when comparing successions of different localities.

Bed PC-1 yield perisphinctid ammonites not yet identified. Bed PC-2 belongs to the base of the Mendozanus Zone, “Fauna A” of Parent et al. (2006) recorded previously in Picún Leufú, Cerro Lotena, La Amarga and Pampa Tril (Fig. 1), and characterized by the ammonites “*Lithacoceras*” n. sp. aff. *malarguense*, *Choicensisphinctes* cf. *windhausenii* and *Catutosphinctes* cf. *mendozanus*. Beds PC-3 and lower part of PC-4 can be attributed to the Zitteli Zone by the occurrence of the index and guide species *Pseudolissoceras zitteli* (Burckhardt, 1903), associated with large adult macroconchs of an undescribed species of *Choicensisphinctes* which in P. Leufú, C. Lotena and La Amarga is typical of the lower part of this zone. The upper part of bed PC-4 has not yielded ammonites so that only conventionally, by lithological continuity is included in the Zitteli Zone. Beds PC-5 – PC-11 have yielded ammonites of the genus *Catutosphinctes*, but too poorly preserved for specific identification; this part of the succession is sandwiched by beds of the Zitteli Zone and, above, beds of the Internispinosus Zone, therefore they could likely belong to the Proximus Zone if this unit is represented at this locality. Beds PC-12 – PC-14 may be assigned to the Rafaeli Subzone of the Internispinosum Zone (Leanza & Zeiss 1992); *C. rafaelli* and *C. araucanense* (Leanza, 1980) are known to occur in the lower part of the Internispinosum Zone at Los Catutos (Leanza & Zeiss 1992) and C. Lotena (Leanza, 1980). Nothing can be said about the biostratigraphy, so the age, of the beds PC-15 – PC-17 for they have not yielded ammonites. The Tithonian record of ammonites in the area, including Los Catutos, P. Covunco and C. Alazanes, seems to end in the Internispinosum Zone. However, the fragments from C. Alazanes included in *Corongoceras* cf. *alternans* (in Parent 2001: fig. 8K-L), which have suggested the Alternans Zone (Late Tithonian), are more naturally included in *Catutosphinctes* for in C. Lotena have been collected in the Proximus and Internispinosum zones adult macroconchs of species of this genus which have identical portions of bodychamber at comparable diameters.

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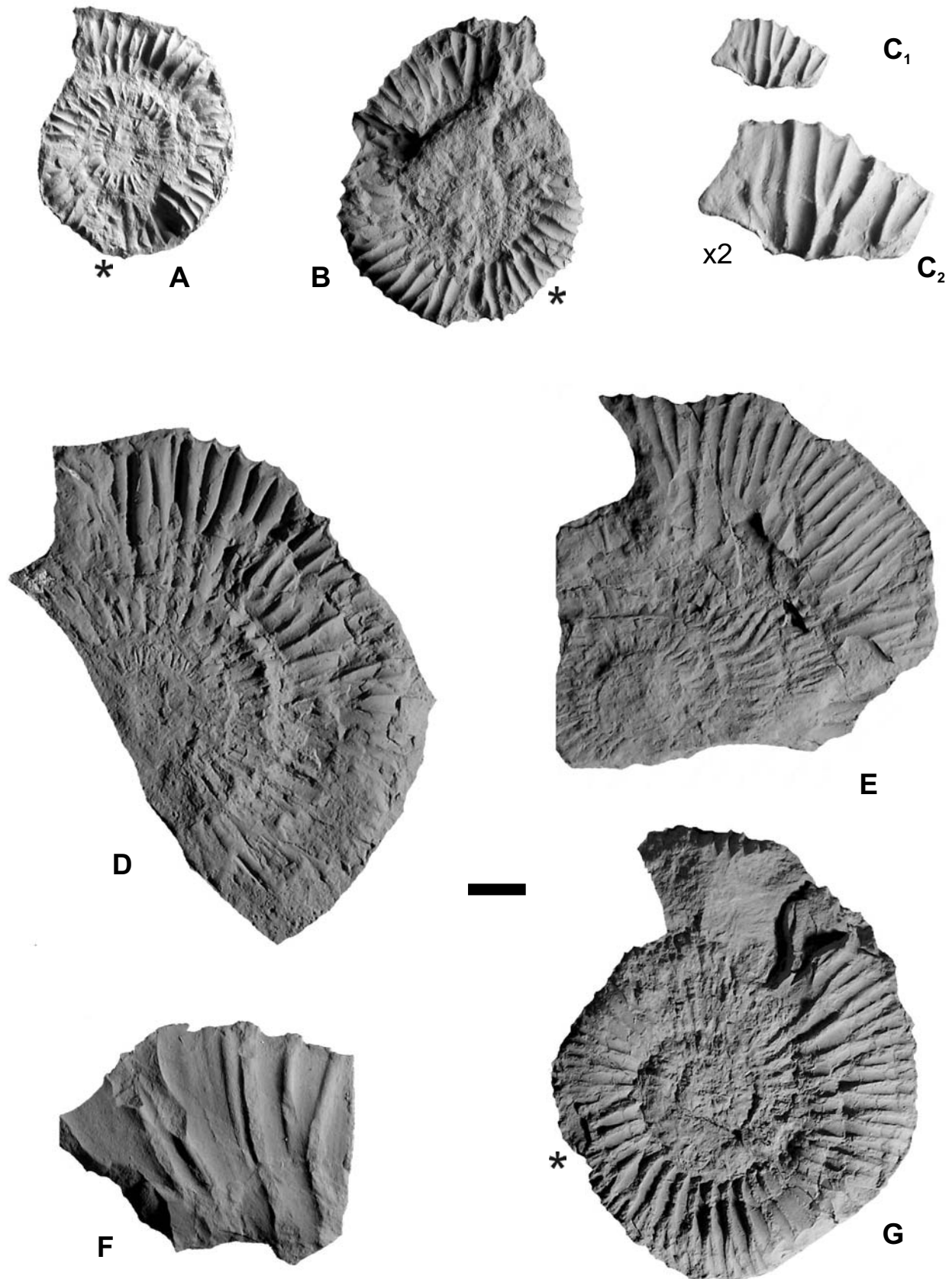


Figure 3. *Catatosphinctes rafaeli* Leanza & Zeiss, 1992 [M&m]. Portada Covunco, Vaca Muerta Fm., Internispinosum Zone, Middle Tithonian. **A:** complete adult microconch with lappets (MOZP 6829/2), bed PC-14. **B:** complete adult microconch with lappets (MOZP 6829/1), bed PC-14. **C:** peristome of an adult microconch (MOZP 6829/3; natural size: C₁; double size: C₂), bed PC-14. **D:** probably complete adult macroconch with peristome (MOZP 6830), bed PC-14. **E:** adult macroconch with peristome (MOZP 6836), bed PC-12. **F:** Pre-peristomatic portion of bodychamber of an adult macroconch (MOZP 6837/2), bed PC-12. **G:** adult macroconch (MOZP 6835), bed PC-12. All natural size (x1) except C₂ enlarged (x2). Bar scale: 10 mm for A-B, C₁, D-G.

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