

Aalenian phylloceratid ammonites from Picún Leufú, Neuquén Basin, Argentina

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Abstract

Aalenian-Bajocian phylloceratid ammonites, typically oceanic, are being increasingly recorded in the Neuquén Basin. In this paper we describe three species, one of them new: *Costiphyloceras limayense* n. sp. The other two are: *Phylloceras perplanum* (Prinz) and *Calliphyloceras* cf. *achtalense* (Redlich). According to the literature *Calliphyloceras* and *Phylloceras* are the most common phylloceratid genera in the Andean Aalenian.

Keywords

Phylloceras, *Calliphyloceras*, *Costiphyloceras*, new species, Aalenian, Argentina.

1. INTRODUCTION

During the Jurassic the Neuquén Basin (Fig. 1A) was separated from the Palaeopacific Ocean by a volcanic arc of Andean orientation (Digregorio *et al.*, 1984; Spalletti 2013), forming a restricted marginal basin. Under this configuration it would be not expected to find oceanic ammonites (phylloceratids and lycoceratids) in the basin more than sporadically. Nevertheless, Aalenian phylloceratids have been described or cited from several localities of the Neuquén and Tarapacá basins. Westermann & Riccardi (1982) described *Phylloceras trifoliatum* Neumayr, 1871 and *Calliphyloceras disputabile* (Zittel, 1869) from the Aalenian-Bajocian of Mendoza; Bodjanic *et al.* (1985) figured *Phylloceras* cf. *trifoliatum* from Sierra de Varas; Hillebrandt & Westermann (1985) have cited large *Phylloceras* from Manflas; Parent (2022: fig. 4A-B) figured *Phylloceras* cf. *trifoliatum* Neumayr, 1871 from the Manflasensis Zone in the locality studied here. Furthermore, Joly (2012) has described an interesting fauna of lower Bajocian phylloceratids from Paso del Espinacito and discussed at length the possible palaeogeographic relationships, concluding that the most suitable migrational way

between the Andean basins and the Tethys was the Caribbean Corridor.

This paper describes three species of the family Phylloceratidae collected from the lower Aalenian Manflasensis Zone of the Los Molles Formation in Picún Leufú.

2. STRATIGRAPHIC FRAMEWORK

The studied ammonites were collected from outcrops of the Los Molles Formation, exposed in a section about 7 km west of the bridge of the National Road-40 over the stream Arroyo Picún Leufú (Fig. 1B). The stratigraphy of the area has been studied by several authors (e.g. Groeber, 1952; Volkheimer, 1973; Westermann & Riccardi, 1975; Leanza, 1993), and was recently described by Leanza & Hugo (1997).

In the study area the Aalenian rocks of the Los Molles Formation are mostly covered. However, from the better exposed parts there ammonites were collected from three levels. The succession, entirely belonging to the Los Molles Formation, is as follows from top:

- Level PL-0-7: 2.2 m of black shales with calcareous

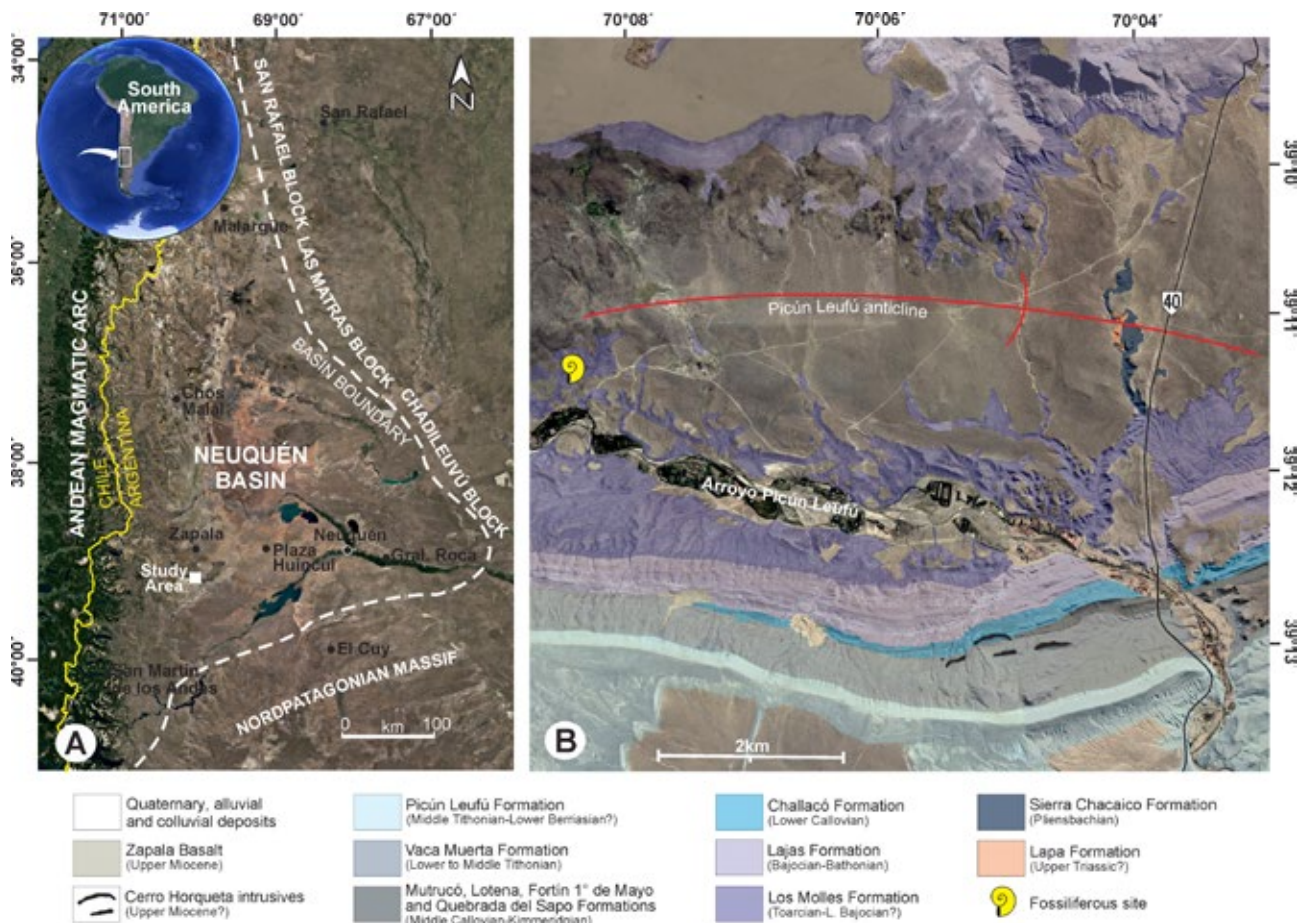


Fig. 1: A: The Neuquén Basin with indication of the study area. B: Geological map of the study area with indication of the studied section.

concretions. Ammonites: a large, discoidal and almost smooth specimen of *Bredya manflasensis* Westermann (in Westermann & Hillebrandt, 1985: pl. 3: 1).

- Level PL-0-6: 10 m of black shales, poorly exposed.
- Level PL-0-5: about 2 m, covered.
- Level PL-0-4: 5.8 to 6.2 m of black shales, poorly exposed.
- Level PL-0-3: 1.5 to 1.9 m of black shales with calcareous concretions. Ammonites: *Tmetoceras scissum* (Benecke, 1865), *Bredya* cf. *delicata* Westermann, 1985, *Pseudapteroceras* cf. *klimakomphalum* (Vacek, 1886), and the phylloceratids described below: *Phylloceras perplanum* (Prinz, 1904), *Calliphylloceras* cf. *achtalense* (Redlich, 1894), and *Costiphylloceras limayense* n. sp.
- Level PL-0-2: 0.5 to 0.7 m of yellowish brown, coquinoid, fine calcareous sandstone. Ammonites: *T. scissum*, *Hildatoides* n. sp. aff. *retrocostatum* Hillebrandt, 1987, *Bredya* cf. *manflasensis* (cf. Hillebrandt & Westermann 1985: pl. 4: 1-4), and *Phylloceras* cf. *trifoliatum*. The gastropod *Eucycloscala?* sp. (in Gründel *et al.*, 2004) is abundantly represented by

fragmentary specimens. This assemblage defines the *scissum* Hz., a biohorizon of the Manflasensis Zone (see Parent, 2022).

- Level PL-0-1: more than 1 m of black shales, poorly exposed. Below this level the succession is covered. The ammonite fauna indicates the studied succession is Aalenian in age, and according to the zonation established by Hillebrandt & Westermann (1985; updated in Westermann, 1992 and Parent, 2022), clearly assignable to the Manflasensis Zone.

3. SYSTEMATIC PALAEOLOGY

All the specimens come from the level PL-0-3, except the MOZ-PI-6643 (Fig. 2F) which was collected loose, likely from the overlying level. These are housed at the Museo Provincial de Ciencias Naturales “Prof. Dr. Juan A. Olsacher”, Zapala (MOZ-PI). The dimensions are noted as *D*: diameter, *H*: whorl height, *E*: whorl width, *O*: width of the umbilicus, *h*: index *H/D*, *e*: index *E/D*, *o*: index *O/D*.

Suborder Phylloceratina Arkell, 1950
 Superfamily Phylloceratoidea Zittel, 1884
 Family Phylloceratidae Zittel, 1884
 Subfamily Phylloceratinae Zittel, 1884
 Genus *Phylloceras* Suess, 1865

Distribution: Hungary, France (Joly, 2000: 48), Argentina.

Subfamily Calliphylloceratinae Spath, 1927
 Genus *Calliphylloceras* Spath, 1927

Type species: *Ammonites heterophyllus* J. Sowerby, 1820; by original designation.

Type species: *Phylloceras disputabile* Zittel, 1869; by original designation.

***Phylloceras perplanum* Prinz, 1904**

Fig. 2A-C, Table 1

- ? 1871. *Phylloceras trifoliatum* n. sp. – Neumayr, p. 309, pl. 12, figs 2, 3.
 1891. *Phylloceras trifoliatum* Neumayr – Haug, p. 64.
 V 1904. *Phylloceras perplanum* nov. sp. – Prinz, p. 40, pl. 27, figs 3, 4, pl. 36, fig. 6.
 V 1912. *Phylloceras trifoliatum* Neumayr – Roman & Genevieux, p. 65, pl. 1, fig. 1.
 1913. *Phylloceras trifoliatum* Neumayr – Roman, p. 3, pl. 1, fig. 16.
 V 1967. *Phylloceras?* *perplanum* Prinz – Géczy, p. 21, pl. 4, figs 1, 5, 6, pl. 63, fig. 16-18.
 ? 1991. *Phylloceras perplanum* Prinz – Rulleau, p. 4, pl. 3, figs 1, 2.
 non 1991. *Phylloceras* aff. *trifoliatum* Neumayr – Rulleau, p. 4, pl. 22, figs 1, 2.

Holotype: By monotypy, the specimen figured by Prinz (1904: pl. 27: 3-4), housed by the Hungarian Institute of Geology (Budapest) under the number J-1057; type locality Csernye, Bakony Mountains, Hungary; upper Aalenian (Bajocian?).

Material: Three juvenile phragmocones (MOZ-PI-6640-6642).

Description: The conch of this species is compressed and very involute, the flanks slightly rounded and smooth, as well as the internal mold; there are no constrictions. The three specimens studied are close to the Hungarian and French representatives of the species, also in their dimensions at comparable diameter (see Joly, 2000: 48).

Occurrence: Lower Aalenian, Manflasensis Zone.

***Calliphylloceras* aff. *achtalense* (Redlich, 1894)**

Fig. 2D-F, Table 2

1894. *Phylloceras achtalense* n. sp. – Redlich, p. 77, pl. 3, fig. 10a-d.
 1958. *Calliphylloceras achtalense* (Redlich) – Beznosov, p. 25, pl. 3, fig. 2a-c.
 V 1977. *Calliphylloceras heterophylloides* (Oppel) – Joly, p. 213, pl. 10, figs 2-3, 7, pl. 11, figs 1-5, pl. 12, figs 1, 6, 7, pl. 21, figs 1, 3, pl. 44, figs 5-10, pl. 45, figs 1-4, 12a, b, pl. 50, figs 1-2.

Material: Three phragmocones (MOZ-PI-6637-6638, 6643).

Description: The three specimens studied are very similar, rather compressed with *E/H* ranging from 0.52 for the more compressed specimens up to 0.66. The constrictions run slightly flexuous across the flanks, clearly proverse in the upper third and venter.

Remarks: The appearance of the constrictions perfectly matches those of the Tethyan *C. achtalense*. Furthermore, the whorl section of the specimen in Fig. 2D is very similar to that of the lower Bathonian *C. achtalense* from St-Benin d'Azy (Joly, 2000: fig. 4, pl. 13). The present specimens are phragmocones, smaller than those studied by Joly (2000: 68); however, Tethyan specimens of similar sizes (Collection Fourel in Poitiers, n° 720, from Claps et Septèmes, and the specimens n° 10005 de Lyon) are very similar in morphology and relative dimensions. The umbilicus is narrow in the specimens from Picún Leufú. Thus, there are close similarities between the present specimens and those of the Tethys, but they are

Table 1: Dimensions of *Phylloceras perplanum* Prinz, 1904 taken at the maximum diameter preserved.

	<i>D</i>	<i>H</i>	<i>E</i>	<i>O</i>	<i>h</i>	<i>e</i>	<i>o</i>	<i>E/H</i>
MOZ-PI-6640	31.5	20.5	10.0	2.1	0.65	0.31	0.06	0.48
MOZ-PI-6641	33.6	21.0	10.5	2.0	0.62	0.31	0.06	0.50
MOZ-PI-6642	12.0	7.0	4.0	1.5	0.58	0.33	0.15	0.57

Table 2: Dimensions of *Calliphylloceras* aff. *achtalense* (Redlich, 1894).

	<i>D</i>	<i>H</i>	<i>E</i>	<i>O</i>	<i>h</i>	<i>e</i>	<i>o</i>	<i>E/H</i>
MOZ-PI-6637	47.4	27.4	14.7	2.5	0.58	0.31	0.05	0.54
	33.0	18.0	12.0	2.5	0.54	0.36	0.07	0.66
MOZ-PI-6643	37.9	22.1	11.5	3.1	0.58	0.30	0.08	0.52

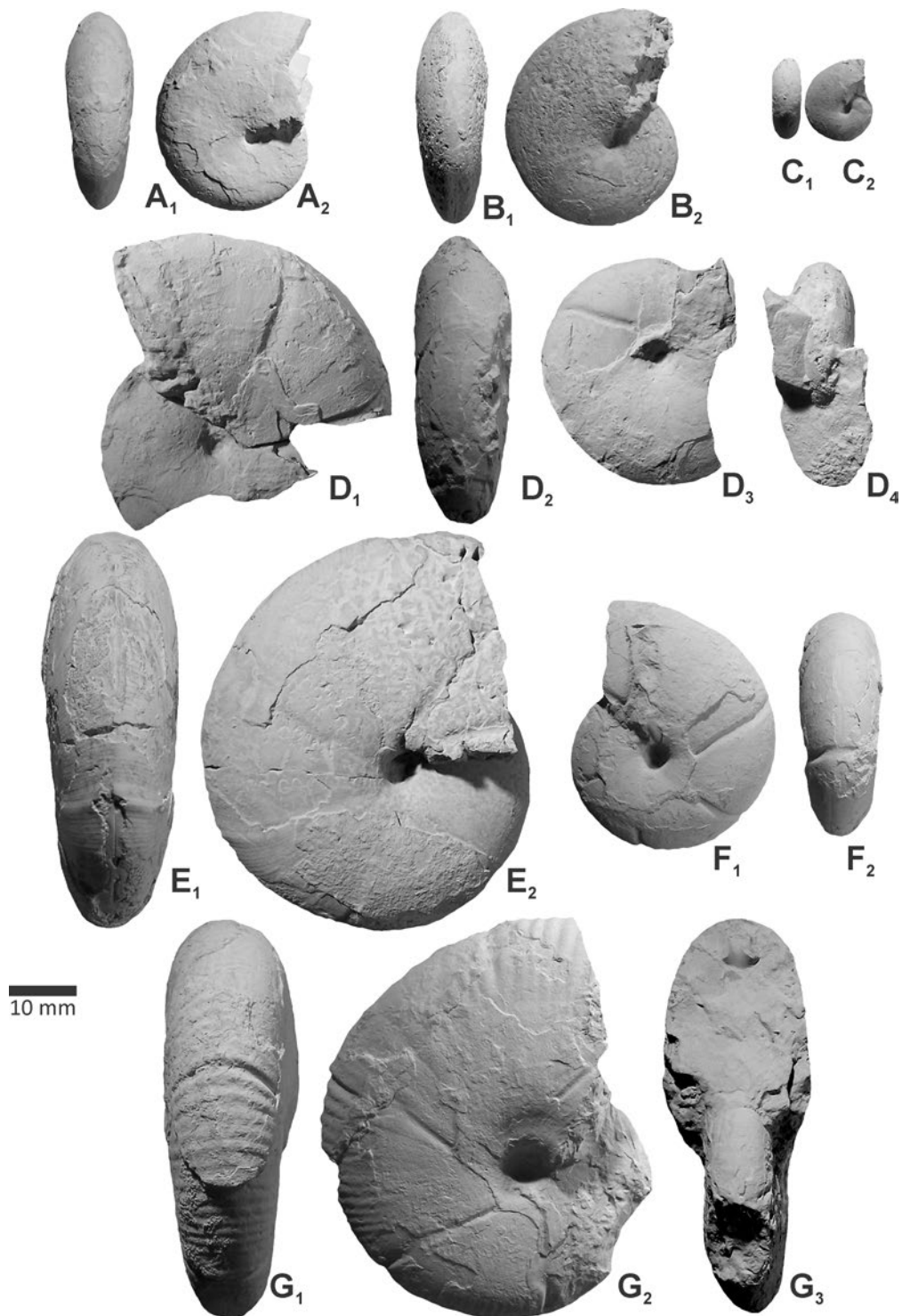


Fig. 2: Phylloceratid ammonites from the lower Aalenian of Picún Leufú, Los Molles Formation. **A-C:** *Phylloceras perplanum* Prinz, 1904; juvenile phragmocones (A: MOZ-PI-6640; B: MOZ-PI-6641; C: MOZ-PI-6642). **D-F:** *Calliphylloceras* aff. *achtalense* (Redlich, 1894); phragmocones (D: MOZ-PI-6637; E: MOZ-PI-6638; F: MOZ-PI-6643). **G:** *Costiphylloceras limayense* sp. nov.; phragmocone (MOZ-PI-6639). – All natural size.

of different ages. In the Tethys the older *C. ahtalense* are Bajocian in age, whereas the present specimens are Aalenian.

Occurrence: Lower Aalenian, Manflasensis Zone.

Distribution: Georgia, France (see also Joly, 2000: 69), Argentina.

Genus *Costiphyloceras* Joly, 2000

Type species: *Ammonites argelliezi* Reynes, 1868; by original designation.

Costiphyloceras limayense sp. nov.

Fig. 2G, Table 3

Derivation of the name: After Rio Limay of which the Arroyo Picún Leufú is a tributary.

Type locality and horizon: Picún Leufú (Fig. 1); lower Aalenian, Manflasensis Zone.

Holotype: The only specimen known (Fig. 2G), MOZ-PI-6639.

Description: The new species is characterized by a conch closely resembling some *Calliphyloceras*, but clearly distinguished by the occurrence of pronounced ribs in the upper third of the flanks and, especially, on the venter. The ventral ribs are evenly spaced. The whorl section is subrectangular. The constrictions, five visible in the last whorl, are slightly sigmoidal through the flanks, and proverse on the venter.

Remarks: The critical feature which leads to the creation of a new species is the occurrence of ribs especially developed on the ventral area (see Joly, 2000: 11, 90). The species currently included in *Costiphyloceras* have strong ribs on the phragmocone and on the bodychamber, but they are never so dense and evenly spaced as in the new species.

According to the relative dimensions, constrictions, whorl section and septal suture line the species of the genus *Costiphyloceras* are very similar to those of the genus *Calliphyloceras*. The lineage of the *Costiphyloceras* in Europe disappears before the Middle Bathonian whereas the latest *Calliphyloceras* could reach into the Berriasian. The stratigraphic gap (approximately Berriasian-Barremian) between the latest *Calliphyloceras* and the earliest *Neocalliphyloceras* Besairie, 1936 seems to justify the establishment of this latter genus. The conchs of *Neocalliphyloceras* resemble those of *Calliphyloceras*, but the septal suture line closely resembles that of *Salfeldiella* Spath, 1927. Consequently, it seems convenient to maintain the genus *Neocalliphyloceras*.

4. CONCLUSION

Phylloceratid ammonites in the southern Neuquén Basin are abundant in some levels of the Aalenian. *Calliphyloceras* and *Phylloceras* seem to be the most common phylloceratid genera in the Andean Aalenian (e.g., descriptions or citations in Westermann & Riccardi, 1982, Bodganic *et al.*, 1985, Hillebrandt & Westermann, 1985); *Costiphyloceras* is described for first time in the region.

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Table 3: Dimensions of the holotype of *Costiphyloceras limayense* sp. nov.

	<i>D</i>	<i>H</i>	<i>E</i>	<i>O</i>	<i>h</i>	<i>e</i>	<i>o</i>	<i>E/H</i>
MOZ-PI-6639	61.0	33.6	20.0	3.5	0.55	0.32	0.06	0.59

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