

A RETIOLITID GRAPTOLITE FAUNA FROM THE TALACASTO AREA, CENTRAL PRECORDILLERA OF SAN JUAN, ARGENTINA, AND ITS AGE SIGNIFICANCE

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INTRODUCTION

GRAPTOLITES ARE presently the most important biostratigraphic and correlation tool in the study of the Silurian sequences in the Argentine Precordillera, but are concentrated primarily in Upper Llandovery and Upper Ludlow strata of the region. For this reason, parts of some stratigraphic units have been poorly dated. The recovery of a small Upper Llandovery graptolite fauna in the lower one-third of La Chilca Formation helps in resolving this problem, and that fauna is the focus of this study. Brachiopods, trilobites, bivalves and ostracodes, while present in the same stratigraphic intervals, are less frequent and less studied and, thus, are currently useful only at the Series level.

GEOLOGICAL SETTING

Silurian sedimentary rocks are widely distributed in the Central Precordillera of San Juan Province (Fig.1) (Baldi and Chebli, 1969). They are composed of siliciclastic marine deposits, including those crossing the Ordovician- Silurian boundary in the lowermost part of the sequence (Cuerda *et al.*, 1982, 1988; Melendi & Volkheimer, 1982).

The Central Precordillera includes the classical, widespread and well-exposed Silurian deposits of the Tucunuco Group (Cuerda, 1969) complete with their assemblages of various fossil groups such as graptolites, brachiopods and trilobites. Outcrops of the Tucunuco Group range geographically from the tributaries of the Jachal River in the north, to La Dehesa Range in the south, a belt 140 km long. The structural style is characterized by a system of blocks tilted to the west, bounded between north-south oriented reverse faults. The Tucunuco Group includes La Chilca Formation (Late Asghill to Early Wenlock in age) and the overlying Los Espejos Formation (Wenlock? to Ludlow-Pridoli in age) (Cuerda *et al.*, 1988; Kerlleñevich and Cuerda, 1986). Important progress on the biostratigraphy of the Los Espejos Formation, based on its graptolite fauna, has been done by Rickards *et al.* (1996).

In the Talacasto area, the base of the Silurian sequence lies unconformably on the limestones of the San Juan Formation (Early Ordovician) (Fig. 2), whereas its upper boundary with the Lower Devonian beds is a paraconformity (Peralta, 1990). On this area, La Chilca Formation is about 30 m thick. Baldi *et al.*, 1984, recognized two members: a lower Salto Macho Member (Late Asghill to Llandovery - Early Wenlock) 10 m thick, and an upper Cuarcitas Azules Member (Late Llandovery - Early Wenlock) 20 m thick. The lower part of the lower member consists of laterally continuous cherty pebble conglomerate, up to 30 cm thick, and a continuous, dark gray pelitic succession 4.5 m in thickness. The upper part of this member grades upwards into greenish mudstones and green yellowish, fine-grained sandstones (quarzites) of the overlying Cuarcitas Azules Member. In the Cuarcitas Azules Member, rare graptolites have been found, but thus far has yielded only the long-ranging (Late Llandovery to Late Wenlock) species *Monograptus priodon* (Kerlleñevich and Cuerda, 1986). Other fossils include palynomorphs, *Zoophycos*, *Planolites*, *Chondrites* and other trace fossils. The Cuarcitas Azules Member is overlain in paraconformity by the Los Espejos Formation.

The Salto Macho Member (SMM), the focus of this study, is the more important of the two members since it encloses a number of levels with graptolites and, in particular, the retiolitid and diplograptid described in this paper. SMM outcrops are present as two ribbon-like strips of black shales about 10 km long and only 10 m wide oriented in a NNW direction and have an westerly dip. Up to now only three fossiliferous sections have been found in the unit, and these are identified in the geological sketch (Fig. 1) as follows: 1 - Los Baños; 2 - Quebrada Ancha (Wide Creek) and 3 - Salto Macho. The stratigraphic organization is similar along the entire length of the outcrops; i.e., a thin, continuous basal conglomerate overlain by laterally continuous black shales.

An important advance in the biostratigraphy and correlation of the lower part of the SMM of La Chilca Formation (Los Baños Section, figure 1), was made by Cuerda *et al.*, 1988 while participating in a collaborative field research program jointly sponsored by the Royal Society (England) and the CONICET (Argentina). That study

demonstrated the presence of the latest Ashgill *Normalograptus persculptus* Zone overlain by lowermost Silurian beds, probably of the *acuminatus-atavus* zones).

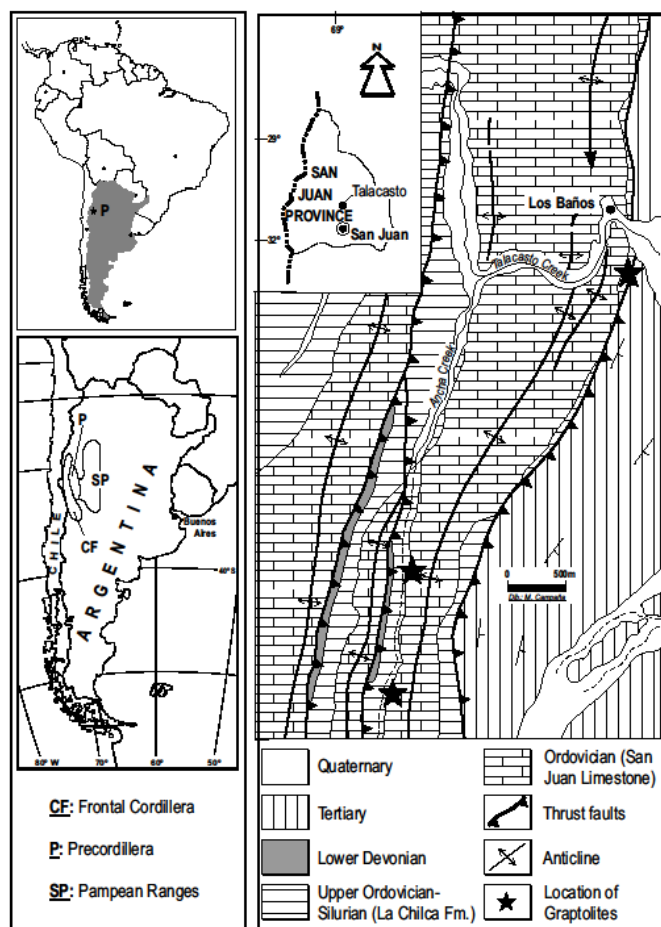


Fig. 1. Geology of the Central Precordillera in the area of Talacasto (After Baldi et al., 1984)

From base to top, the SMM of the Quebrada Ancha section (10 m thick) begins with a basal orthoconglomerate (0.30 m thick) composed entirely of small pebbles of chert derived from the underlying San Juan limestones. The conglomerate is overlain by a succession (1.0 m thick) of thin beds composed of fine-grained sandstones and ferri-ferous – phosphatic oolites in a fangolite (muddy) matrix. Above the oolites is a thin layer (0.15 cm thick) of brown shales with the graptolites of this study. The remainder of the section comprises black shales (8.5 m thick) containing poorly preserved graptolites. In the uppermost part, thick beds of coarse to medium-grained sandstones appear in the sequence and grade into the upper Member (see Figure 2). The “Quebrada Ancha” fossil bearing beds were initially discovered by Peralta (1985) who, for the first time, identified the retiolitid genus *Retiolites* in Argentina.

AGE AND CORRELATION

Prior to the discovery of graptolites in the lower part of La Chilca Formation, the age of the lower part of the stratigraphic unit was poorly understood. The recovery of two identifiable species of graptolites from the lower one-third of the SMM permits a much more precise age-correlation than previously attained. *Pseudoplegmograptus obesus reticulatus* is not widely known, but where known, it is confined to a relatively narrow biostratigraphic range. The type species is described from the *crispus* Biozone (Bouček and Münch 1944), as is its occurrence in northern England (Hutt 1974). In Yukon, northern Canada, it occurs in the broadly defined *turriculatus* Biozone (Lenz 1982). *Metaclimacograptus asejradi* was described from the *turriculatus* Biozone of Algeria (Legrand 1993), and in Spain material tentatively assigned to this species was collected from the *hispanicus* Subbiozone of the *linnaei* Biozone (Gutiérrez-Marco and Storch 1998; Storch 1998). In summary, then, and based on the overlapping ranges of both

species, an age-correlation with either the Early Telychian, *turriculatus* Biozone, or the Middle Telychian, *crispus* Biozone, is strongly suggested for the lower part of the SMM of La Chilca Formation.

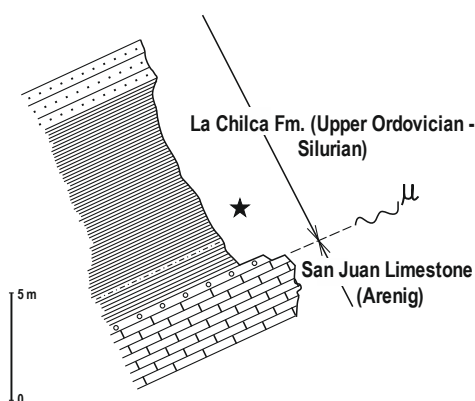


Fig.2. Lower beds of La Chilca Fm. with the location of graptolites.

SYSTEMATIC PALEONTOLOGY

Illustrated specimens are housed in the Museum de La Plata, La Plata, and are given Museum type numbers.

Genus METACLIMACOGRAPTUS Bulman and Rickards, 1968

Type species.—*Diplograpsus hughesi* Nicholson, 1869, from the Llandovery of the Lake District, England.

METACLIMACOGRAPTUS cf. *ASEJRADI* Legrand, 1993

Figure 3.1-3.3; 4.6-4.8

cf. *Metaclimacograptus* (?) *asejradi* LEGRAND, 1993, p. 423, Figs. 5e-f.

? *Metaclimacograptus* cf. *asejradi* Legrand. GUTIÉRREZ-MARCO AND ŠTORCH, 1998, figs. 10e, f.

? *Metaclimacograptus* cf. *asejradi* Legrand. ŠTORCH, 1998, p. 114, pl. 1, fig. 1, text-fig. 3.9.

Description.—Rhabdosome widening very rapidly for first two to three thecae, then widening only very slowly or not at all thereafter. Width distally about 1.5-1.6 mm for partial relief specimens and up to 1.6-1.7 mm for flattened material; rhabdosome length at least 12 mm. Thecae with moderately introverted apertures, strongly geniculated, proximal several thecal pairs with weak genicular hoods, supragenicular walls weakly convex, thecae spaced 5.5-6 in five mm medially. Intertheatal septa strongly sigmoidal. Median septum weakly undulatory.

Material examined.—Several specimens, three of which are moderately well preserved, two in partial negative relief, on the same the bedding plane as *Pseudoplegmatozograptus obesus reticulatus*. Illustrated specimens comprise Museum de La Plata types 29906-29908.

Occurrence.—*Metaclimacograptus* (?) *asejradi* has thus far, been found only in Algeria and the Czech Republic in early to mid Telychian strata.

Discussion.—Unique for this species are the width (considerably greater than the <1.2 mm width said to be characteristic of genus: Koren' and Rickards 1996), genicular hoods only on the proximal several thecal pairs, and a median septum that is only moderately undulatory. The study material differs from the type and Spanish material only in being distinctly wider (1.5-1.7 mm vs. 1.2-1.3 mm for the type, or 1.3-1.4 mm for the Spanish material). It might be significant that the three occurrences of a species with rhabdosomes considerably wider than typical of the genus are from high paleolatitude, cool water regions.

Genus PSEUDOPLEGMATOGRAPTUS Přibyl, 1948

Type species.—*Retiolites perlatus* var. *obesus* Lapworth, 1877, from the Llandovery of Ireland.

PSEUDOPLEGMATOGRAPTUS OBESUS RETICULATUS (Bouček and Münch, 1944)

Figure 4.3-4.5, 4.9-4.12

Plegmatograptus obesus reticulatus BOUČEK AND MÜNCH, 1944, p. 9, text-figs. 1h, 1i, 2c.

Pseudoplegmatozograptus obesus reticulatus (Bouček and Münch), HUTT, 1974, p. 48, text-figs. 12.2, 12.3.

Pseudoplegmatozograptus obesus reticulatus (Bouček and Münch), LENZ, 1982, p. 42, figs. 18b, 18c.

non *Pseudoplegmatozograptus obesus reticulatus* (Bouček and Münch), GE, 1990, p. 81, pl. 10, fig. 1.

Description.--Rhabdosome at least 19 mm long, proximal end not well preserved, but appears to be about 1.1 mm wide, width increasing steadily to about the level of theca 12 and more or less constant thereafter. Maximum width 3.0-3.3 mm, excluding thecal spines. Thecae distinctly orthograptid in profile (see fig. 4.10). Spines projecting ventrally from thecal lips, about 0.8 mm long; distally spines bifurcate, and some bifurcations appear to join with those above and below to form a thin, filamentous network (see arrows, figs. 4.1, 4.2, 4.11, 4.12). Thecae spaced about 7-7.5 in five mm proximally, 6-6.5 in five mm distally. Reticulum well developed, forming a dense and uniform network over the entire rhabdosome, thecal framework not visible. Some specimens have ovate stomata (see arrows, figs. 4.5, 4.6).

Material examined.--Dozens of flattened or almost flattened specimens on gray-green mudstone; mostly moderately well preserved. Illustrated specimens comprise Museum de La Plata types 29909-29917.

Occurrence.--Czech Republic, northern England, northern Yukon, Canada, and from either the *turriculatus* or the *crispus* biozones (Telychian).

Discussion.--Distinctive of the species is the uniformly dense reticulum over the entire rhabdosome. The meshwork is the most dense and uniform of any other species of *Pseudoplegmograptus*. The study material is slightly wider than typical of the type, but is otherwise very similar. The occurrence of stomata has not been previously recognized in this species, but stomata have been recognized in other species of the genus (Lenz and Melchin 1987; Kozłowska-Dawidziuk and Lenz 2001), as well as in the genus *Pseudoretiolites* (e.g., Štorch 1998a). Superficially, the study material is similar to the genus *Stomatograptus* in thecal profile and possession of stomata, but differs in the possession of ventrally projecting thecal spines, some of which appear to bifurcate and join those of the more proximal thecae to form a filamentous and ill-defined ventral network. Better-preserved or more visible ventral networks have been recognized in other species (Elles and Wood 1908; Chen 1984; Gutiérrez-Marco and Štorch 1998b; Štorch 1998).

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FIGURE 1--Location map and partial geological sketch of the Central Precordillera of San Juan in the Talacasto region. The graptolite collection locality of the Quebra Ancha section is shown by the star.

FIGURE 2--Lower portion of the La Chilca Formation. The stratigraphic level of the described graptolites is indicated by the star. Note that the contact between the two stratigraphic units is unconformable.

FIGURE 3--1-3. *Metaclimacograptus* cf. *asejradi* Legrand, 1993. Line drawings of Museum de La Plata types 29908, 29907, and 29906, respectively, showing strongly sigmoidal interthecal septa, weakly undulose median septum, and convex supragenicular thecal walls, x10.

FIGURE 4--2a, 2b, 3-5, 9-11, *Pseudoplegmatograptus obesus reticulatus* (Bouček and Münch, 1944). Museum de La Plata types 29909-29917, respectively. Arrows on 1, 2a, 10, 11 point to bifurcating ventral spines and spine networks. Arrows on 4 and 5 point to stomata. 5, x5; 1, 2, 9-11, x6; 3, x6.5; 4, x10. 6-8, *Metaclimacograptus* cf. *asejradi* Legrand, 1993. Museum de la Plata types 29906-29908, respectively. 6, flattened specimen, 7 and 8 preserved in partial negative relief, x8.