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THE *TRIANGULATUS* BIOZONE (SILURIAN) IN THE "CASERA MELEDIS" OUTCROP (LOWER GRAPTOLITIC SHALES, CARNIC ALPS)

LA BIOZONA A *TRIANGULATUS* (SILURIANO) NELL'AFFIORAMENTO
DI CASERA MELEDIS (SCISTI A GRAPTOLITI, ALPI CARNICHE)

Riassunto breve - Dopo oltre un secolo dalla loro prima segnalazione (1905), vengono descritti e illustrati i graptoliti siluriani della biozona *triangulatus*, provenienti dalla località storica di Casera Meledis (Alpi Carniche). Sui 96 reperti raccolti, sono stati descritti 83 campioni, ascrivibili a 7 generi e 6 specie, tutte riferibili alla biozona a *triangulatus* dell'Aeroniano.

Parole chiave: Graptoliti, Biozona a *triangulatus*, Siluriano, Alpi Carniche.

Abstract - After one century of oblivion from discovery (1905), the Silurian graptolites from the historical locality of "Casera Meledis" (Carnic Alps, NE Italy) are here described; 96 specimens were collected and analyzed, reporting 7 genus and 6 species, all refer to the *triangulatus* Biozone of the Aeronian age.

Key words: Graptolites, *triangulatus* Biozone, Silurian, Carnic Alps.

Introduction

Graptolites are one of the more studied fossil groups of the Palaeozoic Era; they are very common in the black shales, and very useful for biostratigraphic studies on this sedimentary rocks, from Ordovician to Lower Devonian.

During 19th and the first part of 20th centuries, according to previous studies in Czech Republic and England, graptolites started to be studied also in the Carnic Alps, where they were used to differentiate the shales of this area on the basis of their paleontological content.

The first studies on graptolites in this area was made by STACHE (1872), who found the following species: *Diplograptus folium* HISINGER, *D. pristis* HISINGER, *Graptolithus (Monograptus) proteus* BARRANDE, *G. triangulatus* HARKNESS, *G. nilssoni* BARRANDE, *Rastrites* cf. *peregrinus* BARRANDE, *Retiolites* sp. in the Uqua (Uggwa) valley, north of Ugovizza (Udine, Italy), but at that time the area was part of Austrian territory. The same author (STACHE 1881) reported, later, the presence of two graptolites species, which left in open nomenclature but similar to the *Monograptus priodon* and the *Retiolites geinitzianus*, in the area near Mt. Cocco-Malborghetto.

In the same year, Taramelli documented shales with *Monograptus colonus* in the southern slope of the Mt. Lodin (TARAMELLI 1881). At the end of the 19th

century, GEYER (1895) discovered two new outcrops of graptolitic shales (with *Monograptus* sp.) in the northern part of the Carnic Alps, along the Rio Nöbling Valley and in the northern side of the Mt. Lodin group.

The first studies on the Italian part of Carnic Alps started at the beginning of the 20th century, when Vinassa de Regny and Gortani reported many species of well preserved graptolites from an outcrop close to Casera Meledis bassa (VINASSA DE REGNY & GORTANI 1905). Twenty-three species of graptolites were figured by VINASSA DE REGNY (1906) from the same outcrop. Subsequently, GORTANI (1920) described and figured 29 species of graptolites from "Casera Meledis".

GORTANI (1920, 1925), noted that the graptolite association from "Casera Meledis" is very similar to that reported by STACHE (1872) from Rio Uqua (Uggwa) and dated the two associations to the "middle Llandovery".

The aim of this paper is updating data from the historical locality of "Casera Meledis", the first locality with a huge paleontological content discovered in the Italian territory. Since the studies of the first part of the 20th century, graptolites from this area have not been examined and studied, thus, a systematic review was necessary.

Although many of the collected specimens are fragmentary or not well-preserved, it is possible to determine 83 of the 96 collected specimens. Seven genera and six species were determined: *Rhaphidograptus thoernquisti* (ELLES & WOOD), *Demirastrites triangulatus*

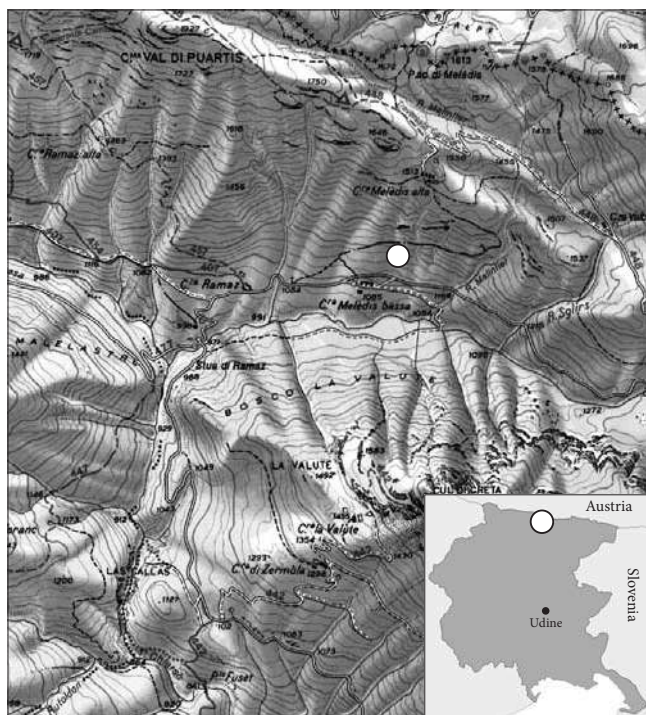
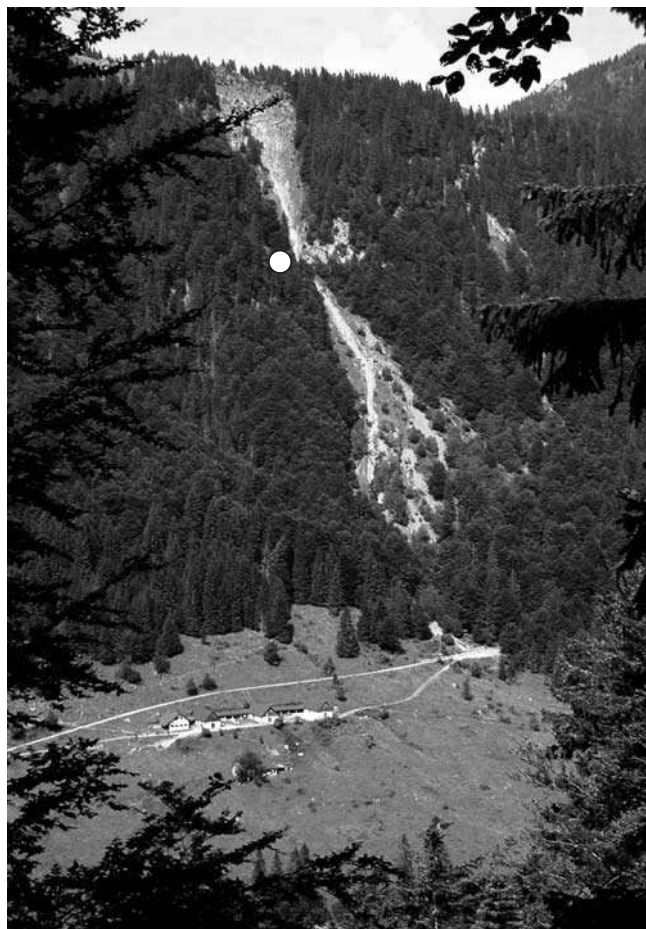


Fig. 1 - The area of "Casera Meledis" (Paularo, Carnic Alps) outcrop and its location in the topographic map (1:20.000, white point).

- L'area dell'affioramento "Casera Meledis" (Paularo, Alpi Carniche) e sua localizzazione nella carta topografica (1:20.000, pallino bianco).

(HARKNESS), *Monograptus revolutus* KURCK, *Monograptus gemmatus* (BARRANDE), *Parapetalolithus palmeus* (BARRANDE), *Climacograptus rectangularis* (M'COY) and *Torquigraptus* sp.

All samples from "Casera Meledis" refer to the *triangulatus* Biozone of the lower Llandovery.

The "Casera Meledis" outcrop

The Meledis section crops out along the path CAI 449a between Casera Meledis bassa and Casera Meledis alta at coordinates N 46° 34' 56.4" E 013° 07' 41.1". It is a very small outcrop, almost hidden in the wood, where abundant shale debris occur on the path and a few beds are exposed after digging a short trench. In general, the stratigraphic sequence of the area is overturned, since Ordovician siltstones and sandstones (Uqua Fm.) occur just above the graptolitic shales, and a large block of middle/upper Silurian *Orthoceras* limestones is exposed several meters below.

Systematic section

The graptolites were colonial organisms and the exterior form (macro-character) or the measurement

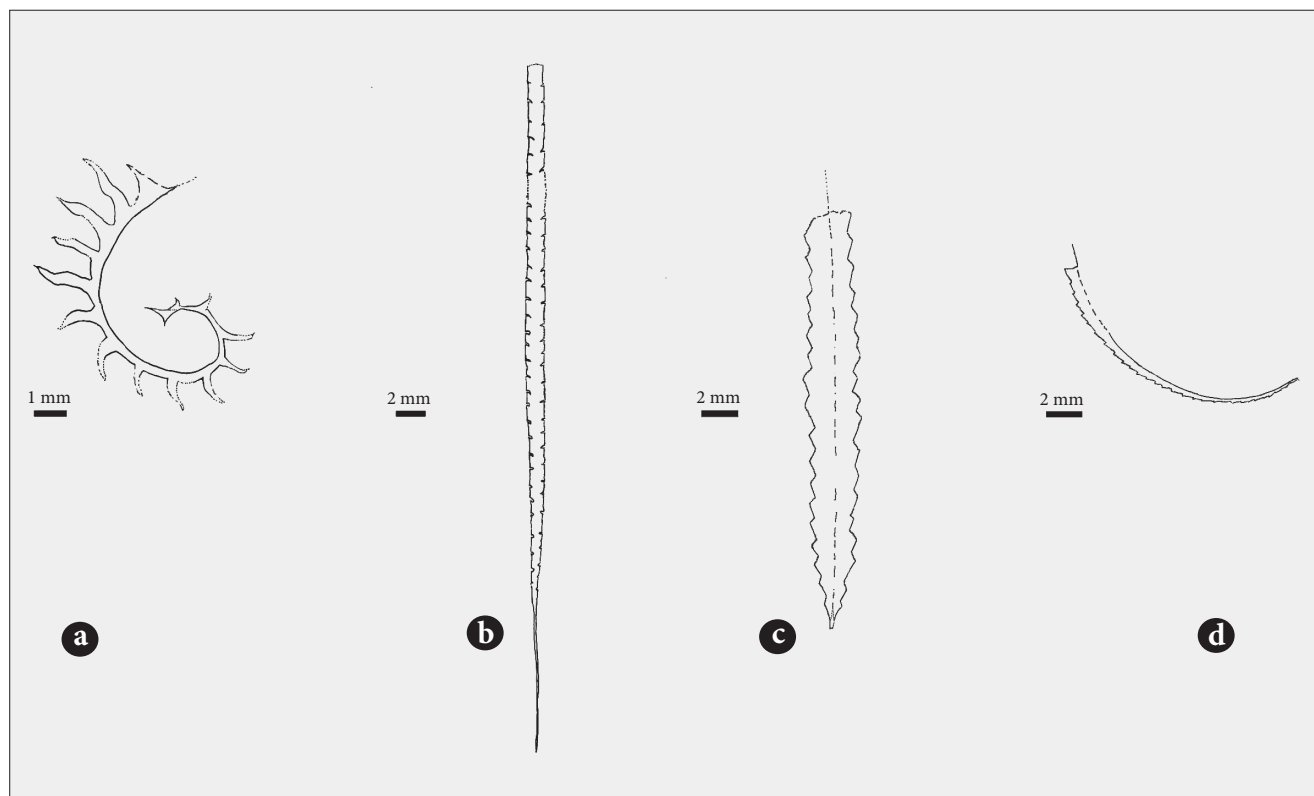


Fig. 2 - Sketch of the more significant graptolites from "Casera Meledis" outcrop. a) *Demirastrites triangulatus* (HARKNESS), specimen MFSNgp 39724; b) *Rhaphidograptus thoernquisti* (ELLES & WOOD), specimen MFSNgp 39728; c) *Parapetalolithus palmeus* (BARRANDE), specimen MFSNgp 39734; d) *Monograptus revolutus* KURCK, specimen MFSNgp 39751.
 - Disegno dei più significativi graptoliti provenienti dall'affioramento di "Casera Meledis". a) *Demirastrites triangulatus* (HARKNESS), esemplare MFSNgp 39724; b) *Rhaphidograptus thoernquisti* (ELLES & WOOD), esemplare MFSNgp 39728; c) *Parapetalolithus palmeus* (BARRANDE), esemplare MFSNgp 39734; d) *Monograptus revolutus* KURCK, esemplare MFSNgp 39751.

(micro-character) of the colony are used to determine them. Among the macro-characters there are: form of the rhabdosome (straight, curve, sigmoidal, etc.), presence of ramifications (secondary branches), thecal morphology etc.

Among the micro-characters there are: measurements of the rhabdosome, measurements of the sicula, measurements of the thecae, overlapping between thecae, angle between thecae and rhabdosome axis, etc. One of the most important micro-character is the 2TRD (two thecae repeat distance), that measures the increase factor of the rhabdosome.

Class Graptolithina BRONN 1846

Order Graptoloidea LAPWORTH 1875

Genus *Rhaphidograptus* BULMAN 1936

Rhaphidograptus thoernquisti (ELLES & WOOD), 1906 (fig. 2.b; fig. 4.1, 4.2)

1906 *Climacograptus thoernquisti* ELLES & WOOD, p. 190, tav. 26, fig. 6a-6f, textfig. 123a-123b.

- 1920 *Climacograptus thoernquisti* (ELLES & WOOD)
 - GORTANI, p. 15, tav. I (I), fig. 16-19.
 1976 *Rhaphidograptus thoernquisti* (ELLES & WOOD)
 - BJERRESKOV, p. 43, fig. 1, pag. 44, fig. 2.
 1978 *Rhaphidograptus thoernquisti* (ELLES & WOOD)
 - BJERRESKOV, tav. 18, fig. 1; tav. 21, fig. 1, 3-5.
 1989 *Rhaphidograptus thoernquisti* (ELLES & WOOD)
 - BARCA & JAEGER, pag. 577, fig. 11 (15).
 1993 *Rhaphidograptus thoernquisti* (ELLES & WOOD)
 - STORCH & SERPAGLI, tav. 5, fig. 2, 4; pag. 29, fig. 8E.
 1994 *Rhaphidograptus thoernquisti* (ELLES & WOOD)
 - ZALASIEWICZ & TUNNICLIFF, pag. 710, textfig. 8E-8J.
 2003 *Rhaphidograptus thoernquisti* (ELLES & WOOD)
 - MASIAR, PODHALANSKA & STEMPIEN-SALEK, pag. 318, textfig. 50.
 2003 *Rhaphidograptus thoernquisti* (ELLES & WOOD)
 - LOYDELL, MANNIK & NESTOR, p. 209, fig. 4a.

Material: 13 rhabdosomes in bad preservation condition (MFSNgp 39719-39731) from "Casera Meledis" (Ud).

Locality: trail between Casera Meledis bassa and Casera Meledis alta.

Description: biserial graptolite, straight and slender, with a long virgella. The longest rhabdosome measured is of 38 mm, but, on average, the sample studied are 30 mm long, with a virgella that can exceed 10 mm. The rhabdosome is about 0,5 mm wide at the theca 1¹, 0,6 mm wide at the theca 3¹, and 1,5-1,7 mm in the distal part. The sicula is straight, about 1,5 mm long with a small aperture (about 0,2 mm), the apex achieve to the level of the 2¹ theca. The thecae are strongly geniculated, with a tiny aperture; on average there are 5-6 thecae in the distally 5 mm.

Observations: the specimens of *Rhaphidograptus thoernquisti* of "Casera Meledis", despite their bad preservation, show the same characteristics as the samples of the same species globally known.

Distribution: Llandovery, *triangulatus* biozone.

Diffusion: global.

Family Monograptidae LAPWORTH 1873

Genus *Demirastrites* EISEL 1911

Demirastrites triangulatus (HARKNESS) 1851
(fig. 2.a; fig. 3.1, 3.2, 3.3; fig. 5.2)

- 1851 *Rastrites triangulatus* - HARKNESS, p. 38, tav. I, fig. 3 a - d.
- 1907 *Monograptus triangulatus* (HARKNESS) - VINASSA DE REGNY, p. 29, tav. I, fig. 14.
- 1920 *Monograptus triangulatus* (HARKNESS) - GORTANI, tav. III, fig. 17-18.
- 1920 *Monograptus triangulatus* var. *cirratus* (HARKNESS) - GORTANI, tav. III, fig. 22-24.
- 1920 *Monograptus raitzhainiensis* (EISEL) - GORTANI, tav. III, fig. 25-27.
- 1985 *Demirastrites triangulatus* (HARKNESS) - XIAOFENG, p. 237, pl. 2, fig. 2 -3.
- 1989 *Monograptus triangulatus* (HARKNESS) - BARCA & JAEGER, p. 577, fig. 18.
- 1993 *Demirastrites triangulatus triangulatus* (HARKNESS) - STORCH & SERPAGLI, p. 51, textfig. 16 A-B.
- 2003 *Demirastrites triangulatus* (HARKNESS) - LOYDELL, MANNIK & NESTOR, p. 209, fig. 4h.
- 2009 *Demirastrites triangulatus* (HARKNESS) - PICARRA, ROBARDET, OLIVEIRA, PARIS & LOMBARDEAUX, p. 47, fig. 5A.
- 2009 *Demirastrites triangulatus* (HARKNESS) - STORCH & KRAFT, p. 63, fig. 8B.

Material: 30 rhabdosomes in bad preservation condition (MFSN_{gp} 39719, 39722b, 39724, 39732-39758) from "Casera Meledis" (Ud).

Locality: trail between Casera Meledis bassa and Casera Meledis alta.

Description: graptolite with a slender and flexuose rhabdosome, hooked-curve in the proximal part and slightly-curved in the distal part. The longest specimen is about 30 mm long, the width of the rhabdosomes is between 0,4-0,6 mm at the first thecae, 0,6-0,8 mm at the third thecae, the maximum width is about 2 mm distally. The thecae are well visible, isolated on the convex part of the rhabdosome; they are triangular, lobate, with the aperture directed to the proximal part of the rhabdosome. The thecal inclination to the axis of the rhabdosome is 20°, and the overlap between thecae is about 1\10 of their length. The 2TRD distally varies between 1,8-2,4 mm long, the thecae are 8-10 in 10 mm (measured in the distal part of the rhabdosome).

Observations: the samples of *Demirastrites triangulatus* from "Casera Meledis", despite their bad preservation, show the same characteristics of the *Demirastrites triangulatus* described from the same area and other locality in the Carnic Alps (VINASSA DE REGNY 1907; GORTANI 1920). *Demirastrites triangulatus* described in China (XIAOFENG 1985), in Sardinia (BARCA & JAEGER 1989; STORCH & SERPAGLI 1993), Lithuania (LOYDELL et al. 2003), France (PICARRA et al., 2009) and Czech Republic (STORCH & KRAFT 2009) show the same shape and measures as the *Demirastrites triangulatus* from "Casera Meledis", here described.

Distribution: Llandovery, *triangulatus* biozone.

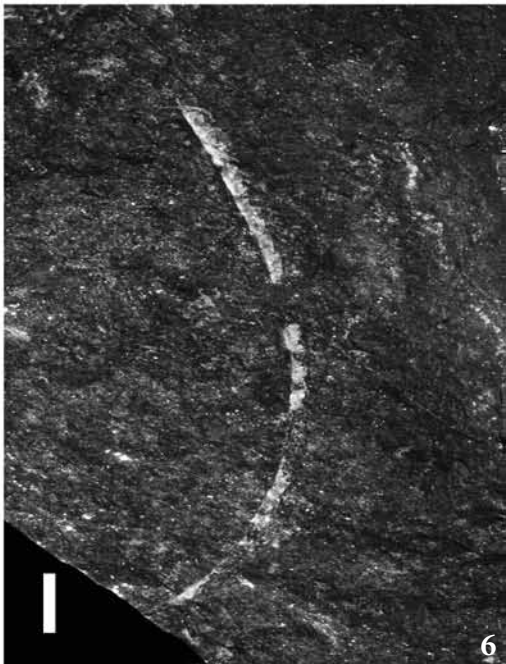
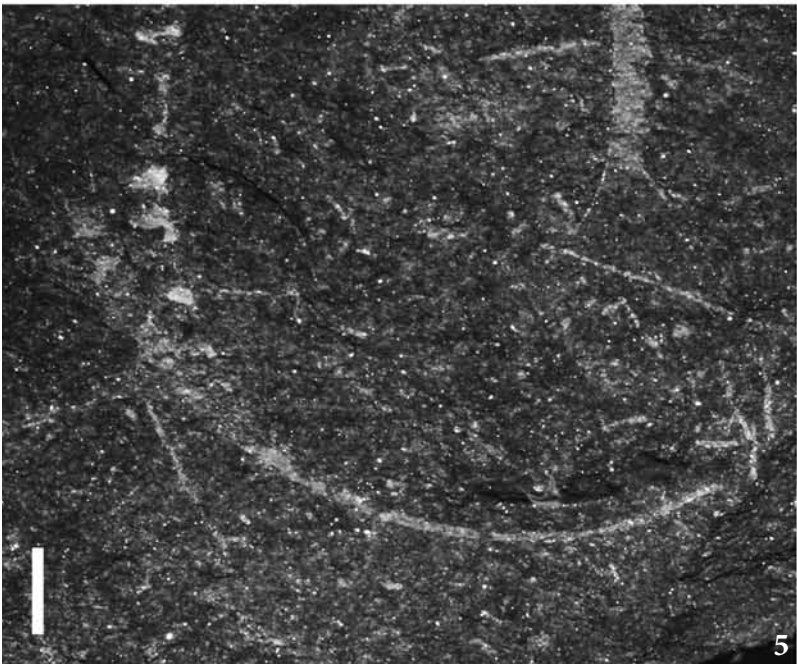
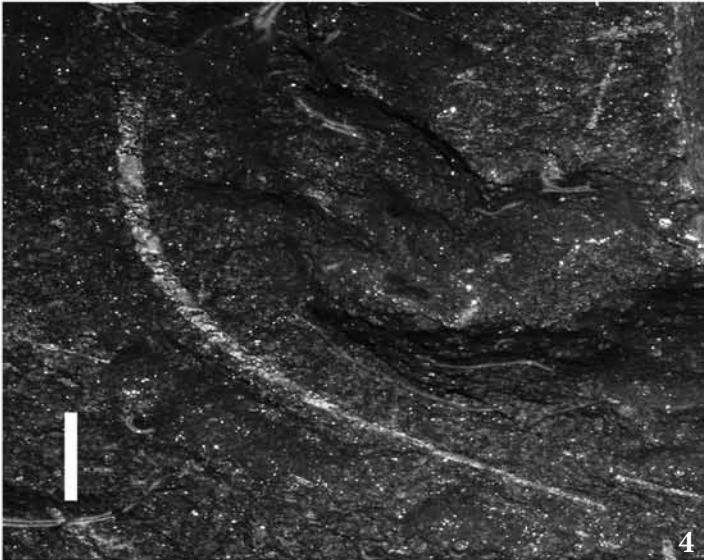
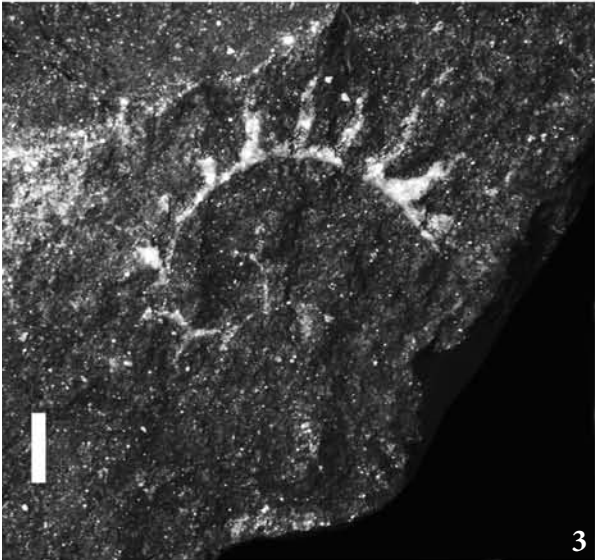
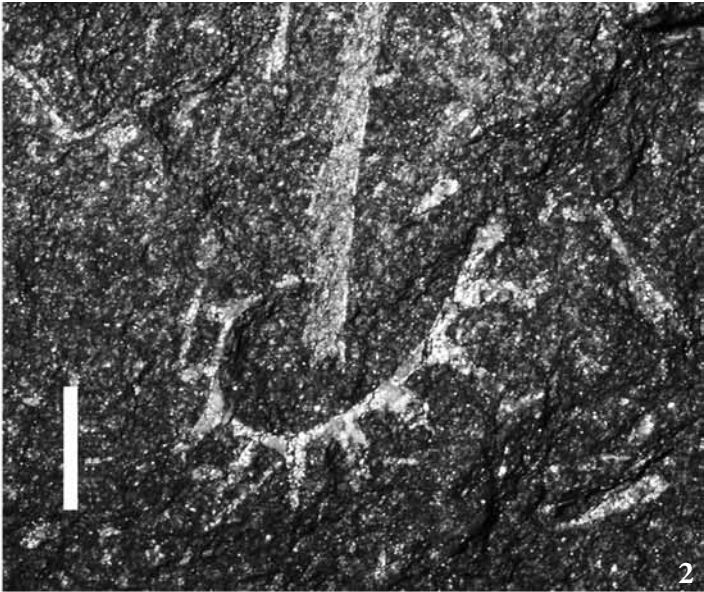
Diffusion: global.

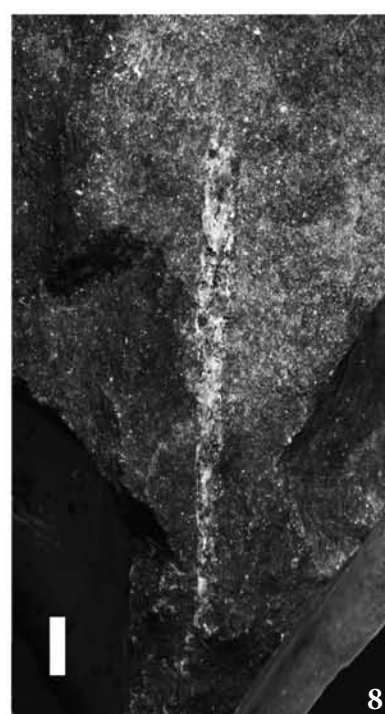
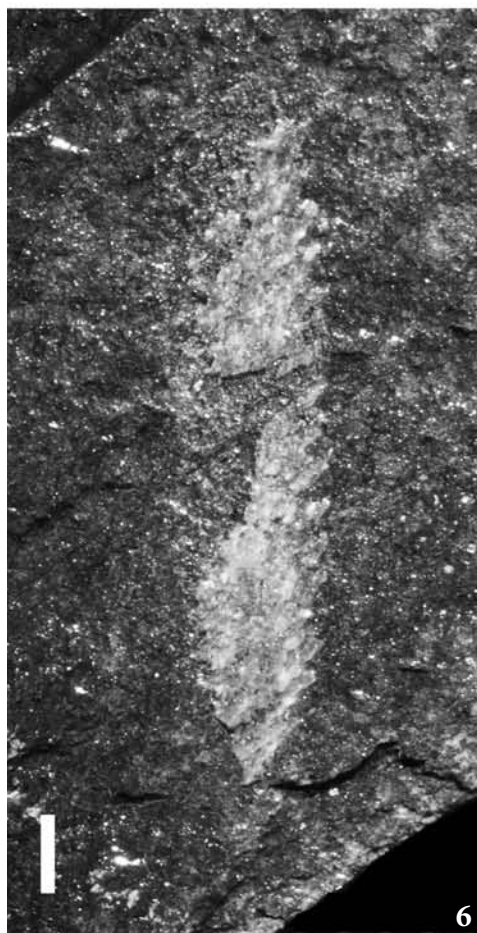
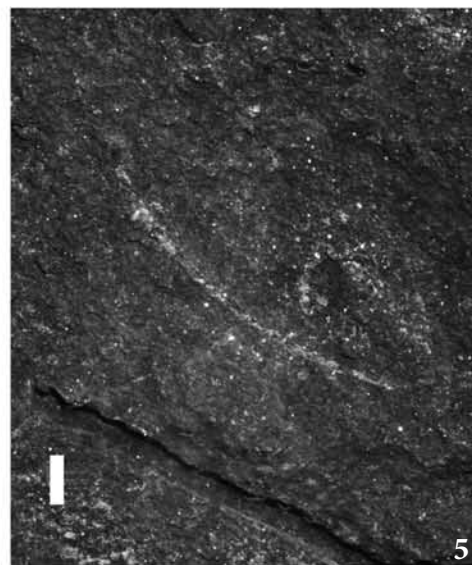
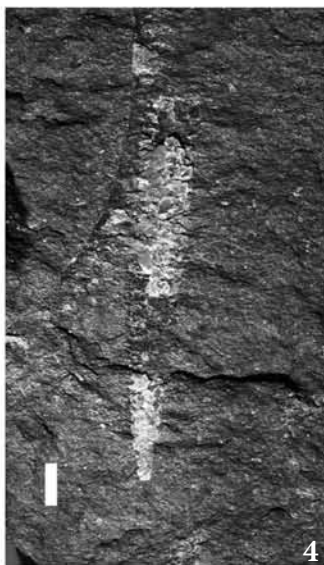
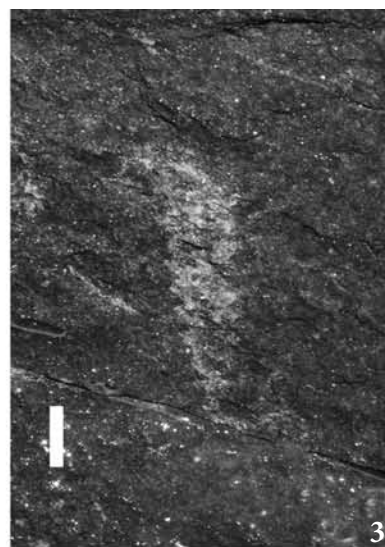
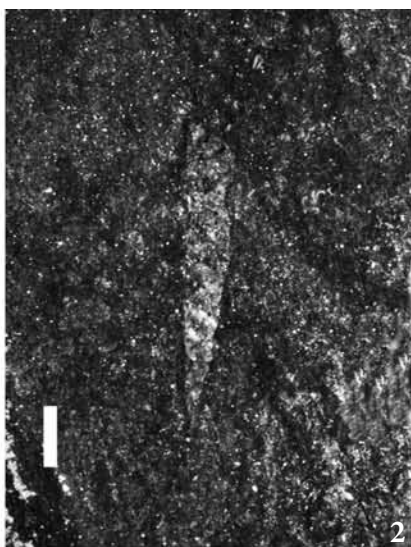
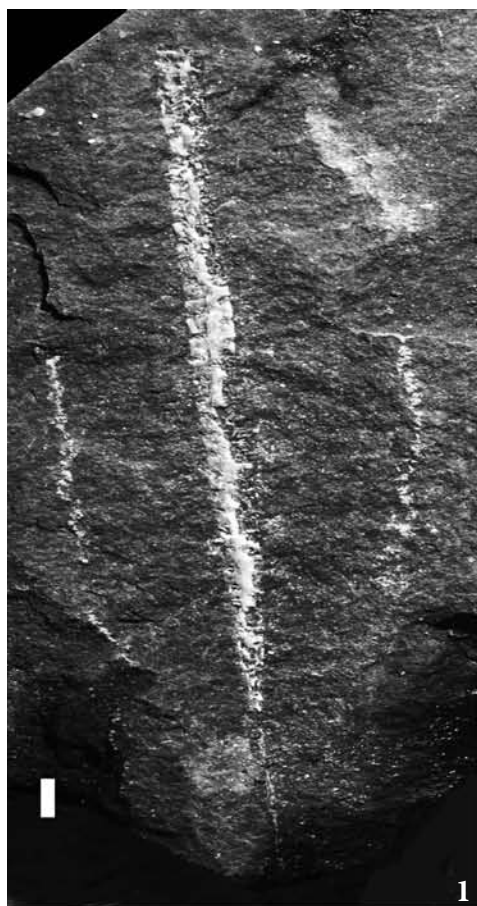
Monograptus revolutus KURCK 1882
(fig. 2.d; fig. 3.4, 3.5, 3.6)

- 1882 *Monograptus revolutus* KURCK, p. 299, tav. XIV, fig. 2-4.
- 1920 *Monograptus revolutus* KURCK - GORTANI, tav. II, fig. 14-17.

Fig. 3 - 1. *Demirastrites triangulatus* (HARKNESS), specimen MFSN_{gp} 39746; 2. *Demirastrites triangulatus* (HARKNESS), specimen MFSN_{gp} 39747; 3. *Demirastrites triangulatus* (HARKNESS), specimen MFSN_{gp} 39724; 4. *Monograptus revolutus* KURCK, specimen MFSN_{gp} 39766; 5. *Monograptus revolutus* KURCK, specimen MFSN_{gp} 39751; 6. *Monograptus revolutus* KURCK, specimen MFSN_{gp} 39755. Reference white bar measure 2 mm. All the photos are taken under a slender level of water to increase the contrast.

- 1. *Demirastrites triangulatus* (HARKNESS), *esemplare* MFSN_{gp} 39746; 2. *Demirastrites triangulatus* (HARKNESS), *esemplare* MFSN_{gp} 39747; 3. *Demirastrites triangulatus* (HARKNESS), *esemplare* MFSN_{gp} 39724; 4. *Monograptus revolutus* KURCK, *esemplare* MFSN_{gp} 39766; 5. *Monograptus revolutus* KURCK, *esemplare* MFSN_{gp} 39751; 6. *Monograptus revolutus* KURCK, *esemplare* MFSN_{gp} 39755. Il trattino bianco è lungo 2 mm. Tutte le foto sono riprese sotto un leggero velo d'acqua per incrementare il contrasto.





- 1978 *Monograptus revolutus* KURCK - BJERRESKOV, pl. 18, fig. 4; pl. 20, fig. 1-4.
 2009 *Monograptus revolutus* KURCK - ZALASIEWICZ, p. 810, fig. 12 s67.

Material: 22 rhabdosomes (MFSNgp 39725, 39732, 39734, 39747, 39751, 39755, 39756, 39759-39773) in bad preservation condition from "Casera Meledis" (Ud).

Locality: trail between Casera Meledis bassa and Casera Meledis alta.

Description: rhabdosome slender, strongly curved in the proximal part that becomes straight distally. The maximum rhabdosome length is about 30 mm long, the width of the rhabdosome at the first teca is 0,2 mm; 0,3-0,4 mm at the 10th, and the maximum rhabdosome width measured is 0,6 mm in the distal part.

The sicula is not well identifiable; the aperture is 0,16-0,2 mm wide. The apertures of the proximal thecae are downward while the next are simple. The overlapping between the thecae is about 1/6, and they form an angle of about 15° with the rhabdosome. The 2TRD at the 2nd thecae is 1,2-1,3 mm, and it is about 1,8-2,4 mm in the distal part of the rhabdosome. In the distal part of the rhabdosome, there are 10-12 thecae in 10 mm.

Observations: the samples of *Monograptus revolutus* KURCK from "Casera Meledis", despite their bad preservation, are comparable with the graptolites cited by GORTANI (1920) from Rio Uqua (Uggwa). These samples are similar to those cited by BJERRESKOV (1978) from Denmark, and to those cited by ZALASIEWICZ et

al. (2009) from the United Kingdom, that have shape and measure similar to the graptolites from "Casera Meledis".

Distribution: Llandovery, *triangulatus* biozone.
Diffusion: global.

Monograptus gemmatus (BARRANDE) 1850
 (fig. 4.5, 4.6)

- 1850 *Rastrites gemmatus* BARRANDE, p. 68, tav. IV, fig. 5.
 1913 *Monograptus gemmatus* (BARRANDE) - ELLES & WOOD, p. 436, pl. 43, figs. 5a-e.
 1920 *Monograptus gemmatus* (BARRANDE) - GORTANI, p. 101, tav. 16 (2), fig. 1-3; tav. 19 (5), fig. 6A; tav. 17 (3), fig. 17-19.
 1998 *Monograptus gemmatus* (BARRANDE) - GUTIÉRREZ-MARCO & STORCH, p. 84, fig. 8c.
 2000 *Monograptus gemmatus* (BARRANDE) - FU, ZHANG & GENG, p. 130, fig. 3.3.
 2002 *Monograptus gemmatus* (BARRANDE) - LOYDELL & MALETZ, p. 193, fig. 1 A-C; p. 195, fig. 3 A-G.

Materials: 5 incomplete rhabdosomes (MFSNgp 39721a, 39737, 39738, 39774, 39775) from "Casera Meledis" (Ud).

Locality: trail between Casera Meledis bassa and Casera Meledis alta.

Description: very slender rhabdosome, straight or slightly curved. The graptolites are in large part fragments, without the proximal part. The maximum length observed is about 23 mm, the width of the rhabdosome is between 0,16-0,24 mm. The sicula is not present. The thecae have a "hooked" shape, not well visible, with the aperture direct downward. The thecal overlapping between thecae is about 1/6 of their length, and the thecae form an angle of 8°-10° with the axis of the rhabdosome. The 2TRD is about 2 mm in the distal part of the rhabdosome. Thecal count is 10-12 in the distal 10 mm of the rhabdosome.

Observations: the graptolites from "Casera Meledis" outcrop are similar to the specimens described by GORTANI (1920) in other sites in the Carnic Alps (Casera Meledis, Uqua, Ramàz, Rio Nöbling and Cristo of Timau) and preserved in the museum collections of Pisa, Perugia, Pavia and Vienna. The *Monograptus gemmatus* figured by FU, ZHANG & GENG (2000) from China are similar to the graptolites from "Casera Meledis" outcrop. The tridimensional specimens from Sweden, described by LOYDELL & MALETZ (2002), are similar to our specimens, but the 2TRD is slightly wider.

Distribution: Llandovery, *triangulatus* biozone.
Diffusion: global.

Fig. 4 - 1. *Rhaphidograptus thoernquisti* (ELLES & WOOD), specimen MFSN gp 39728; 2. *Rhaphidograptus thoernquisti* (ELLES & WOOD), specimen MFSN gp 39730; 3. *Parapetalolithus palmeus* (BARRANDE), specimen MFSN gp 39749; 4. *Parapetalolithus palmeus* (BARRANDE), specimen MFSN gp 39734; 5. *Monograptus gemmatus* (BARRANDE), specimen MFSN gp 39775; 6. *Monograptus gemmatus* (BARRANDE), specimen MFSN gp 39737; 7. *Climacograptus rectangularis* (M'COY), specimen MFSN gp 39766; 8. *Climacograptus rectangularis* (M'COY), specimen MFSN gp 39777. Reference white bar measure 2 mm. All the photos are taken under a slender level of water to increase the contrast.

- 1. *Rhaphidograptus thoernquisti* (ELLES & WOOD), esemplare MFSN gp 39728; 2. *Rhaphidograptus thoernquisti* (ELLES & WOOD), esemplare MFSN gp 39730; 3. *Parapetalolithus palmeus* (BARRANDE), specimen MFSN gp 39749; 4. *Parapetalolithus palmeus* (BARRANDE), esemplare MFSN gp 39734; 5. *Monograptus gemmatus* (BARRANDE), esemplare MFSN gp 39775; 6. *Monograptus gemmatus* (BARRANDE), esemplare MFSN gp 39737; 7. *Climacograptus rectangularis* (M'COY), esemplare MFSN gp 39766; 8. *Climacograptus rectangularis* (M'COY), esemplare MFSN gp 39777. Il trattino bianco è lungo 2 mm. Tutte le foto sono riprese sotto un leggero velo d'acqua per incrementare il contrasto.

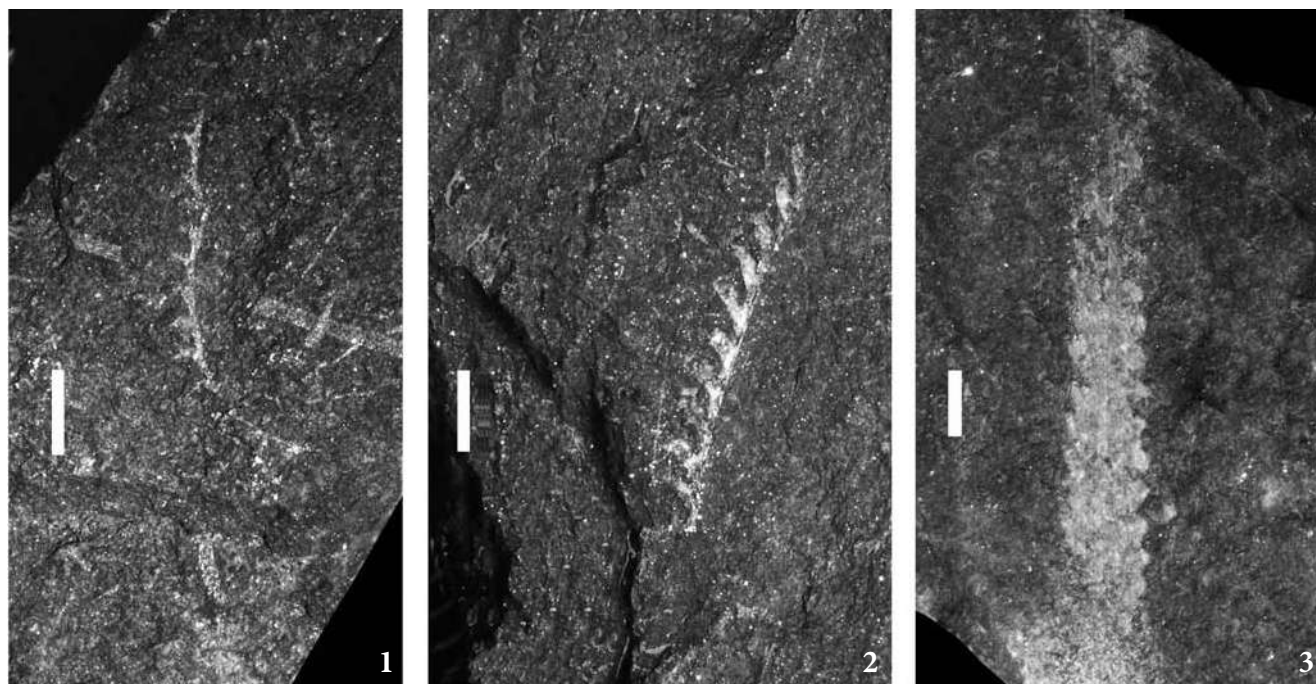


Fig. 5 - 1. *Torquigraptus* sp., MFSNgp 39750; 2. *Demirastrites triangulatus* (HARKNESS), MFSNgp 39737; 3. *Parapetalolithus palmeus* (BARRANDE), MFSNgp 39776. Reference white bar measure 2 mm. All the photos are taken under a slender level of water to increase the contrast.

- 1. *Torquigraptus* sp., MFSNgp 39750; 2. *Demirastrites triangulatus* (HARKNESS), MFSNgp 39737; 3. *Parapetalolithus palmeus* (BARRANDE), MFSNgp 39776. Il trattino bianco è lungo 2 mm. Tutte le foto sono riprese sotto un leggero velo d'acqua per incrementare il contrasto.

Parapetalolithus palmeus (BARRANDE) 1850
(fig. 2.c; fig. 4.3, 4.4; fig. 5.3)

- 1850 *Graptolithus palmeus* var. *lata* BARRANDE, p. 61, pl. 3, figs. 3, 4.
1908 *Petalograptus palmeus* s. str. (BARRANDE) - ELLES & WOOD, p. 274, pl. 32, fig. 1d, text-fig. 188a.
1920 *Diplograptus* (*Petalograptus*) *palmeus* (BARRANDE) - GORTANI, tav. I (I), fig. 35.
1996 *Petalograptus palmeus palmeus* (BARRANDE) - CHURKIN & CARTER, p. 58, fig. 39 A, B, H.
1998 *Parapetalolithus palmeus* (BARRANDE) - GUTIERREZ-MARCO & STORCH, p. 77, fig. 4; p. 84, fig. 8g.

Material: 4 rhabdosomes (MFSNgp 39734, 39749, 39776a-b, 39779) from "Casera Meledis" (Ud).

Locality: trail between Casera Meledis bassa and Casera Meledis alta.

Description: biserial graptolite with a characteristic "leaf" shape; thecae are simple tubular tubes. In our graptolites collection there are only two complete specimens: the longest is 22 mm long; on average, our samples are about 2,8-3 mm wide, with a maximum of 3,6 mm in one specimen. The thecae are simple tubes, with an angle of 40°-45° to the rhabdosome axis, the thecae overlap each other for 3/4 of their length. The 2TRD is about 2-2,6 mm and the thecal count in the

distal part of the rhabdosome is of 12-14 thecae in 10 mm.

Observations: the samples of *Parapetalolithus palmeus* founded on the trail between Casera Meledis bassa and Casera Meledis alta are similar to the specimens founded by GORTANI (1920) in the same locality and housed in the museum collections of Perugia e Pisa. The *Parapetalolithus palmeus* of "Casera Meledis" are well comparable with the figured specimen of *Graptolithus palmeus* var. *lata* by BARRANDE (1850) from Czech Republic, and with the specimens described by ELLES & WOOD (1908) from Scotland. The graptolites described by CHURKIN & CARTER (1996) from Alaska are similar to our *Parapetalolithus palmeus* from the Carnic Alps and are similar to the samples figured by GUTIERREZ-MARCO & STORCH (1998) from Spain.

Distribution: Llandovery *triangulatus* biozone.

Diffusion: U.K., Spain, China, U.S.A., Czech Republic, Carnic Alps.

Climacograptus rectangularis (M'COY) 1850
(fig. 4.7, 4.8)

- 1850 *Diplograptus rectangularis* M'COY, pl. IV, p. 271.
1920 *Climacograptus rectangularis* (M'COY) - GORTANI, tav. I (I), fig. 11, 12.
1920 *Climacograptus rectangularis* var. *alpinus* (M'COY) - GORTANI, tav. I (I), fig. 13, 15.

Material: 4 rhabdosomes in badly condition of preservation (MFSN_{gp} 39757, 39766, 39771, 39777) from "Casera Meledis" (Ud).

Locality: trail between Casera Meledis bassa and Casera Meledis alta.

Description: small biserial Graptolite with a slender shape, thecae with a small "geniculate" aperture. In our specimens there is one small complete *Climacograptus rectangularis* and the longest incomplete specimen is about 20 mm long. The average width is 1,8 mm, with a maximum of 2 mm measured in one specimen. The sicula is not visible or measurable. The 2TRD is about 1,8 mm, and the thecal count on the distal part of the rhabdosome is of 8 thecae in 10 mm.

Observations: the samples of *Climacograptus rectangularis* of "Casera Meledis", despite their bad preservation, show the same characteristic of the graptolites described by (GORTANI 1920) from the same locality of Carnic Alps.

Distribution: Llandovery *triangulatus* biozone.

Diffusion: global.

Torquigraptus sp.
(fig. 5.1)

Material: 1 rhabdosome in bad condition of preservation (MFSN_{gp} 39750) from "Casera Meledis" (Ud).

Locality: trail between Casera Meledis bassa and Casera Meledis alta.

Description: slender and flexed rhabdosome, hooked in the proximal part, slightly curved distally. The rhabdosome is 12 mm long, the width is about 0,8 mm. The thecae are triangular, and the aperture is ornated by slender lappets. The thecal inclination to the rhabdosome axis is 20°, and the overlapping between thecae is 1/10 of their length. The 2TRD distally measured is about of 1,84 mm, the thecae are 7 in 10 mm (measured in the distal part of the rhabdosome).

Observations: the sample MFSN_{gp} 39750 of "Casera Meledis", shows similar form to *Torquigraptus denticulatus* reported by GORTANI (1920) in the locality of Rio Uqua, but the bad preservation of the sample does not permit a precise attribution at the level of species.

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