

Fammenian to Lower Carboniferous? in the Pi section

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Locality - Along the forest track south of Pi between the Quarry and the north end of the Cadí-Moixeró Natural Park.

Lithostratigraphic unit - Uppermost part of the Comabella Fm., La Mena Fm. and lower part of the Barousse Fm.

Age - Upper Frasnian (Upper Devonian)-Lower Tournaisian (Lower Carboniferous)?

What to see - A Famennian section spanning through the Devonian/Carboniferous boundary or very close to it.

How to get there

The locality is accessible through the local paved road from the National N260 to Pi that continues south in a forest track following upstream the Torrent de Pi, until the south margin of the quarry. The section starts there and follows the path towards the north end of the Cadí-Moixeró Natural Park (Fig. 1).

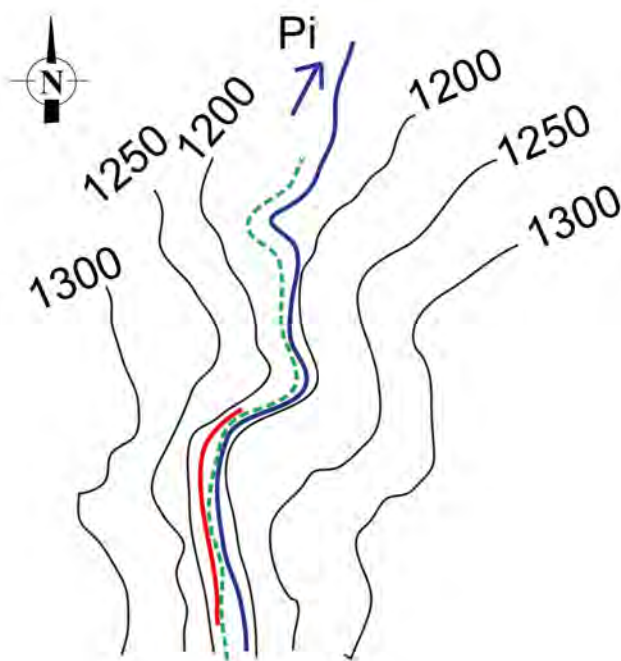


Figure 1. Location map of Pi section.

Purple colours are also common in the lower part. The Barousse Fm. has also grey, green, red, pink and white nodular levels. The section is overturned and the base and top are covered. Besides conodonts, cephalopods and remains of dacroconarids, brachiopods, orthoceratids, crinoids, trilobites and ostracods are also observed. Bioturbation and hard grounds are common in many bed surfaces.

Historical outline

Valenzuela-Ríos carried out an exploratory sampling of the section in the context of a mapping project supported by the Geographical and Geological Survey of Catalonia in 2001. Subsequently a preliminary report, as a result of a Master Thesis, was presented in a professional meeting (Castelló & Valenzuela-Ríos, 2004). Then, Valenzuela-Ríos, Liao and Martínez-Pérez remeasured the section and analysed the conodont content. This section has never been published.

Lithology and fossil content

The section has a thickness of about 60 m and consists of variegated limestone with dominant blue, grey and green colours in the lower and upper parts, coinciding with the top of the Comabella Fm. and the lower part of the Barousse Fm. respectively, and red-wine mostly nodular with some greenish levels corresponding to the La Mena Fm. (Fig. 2).

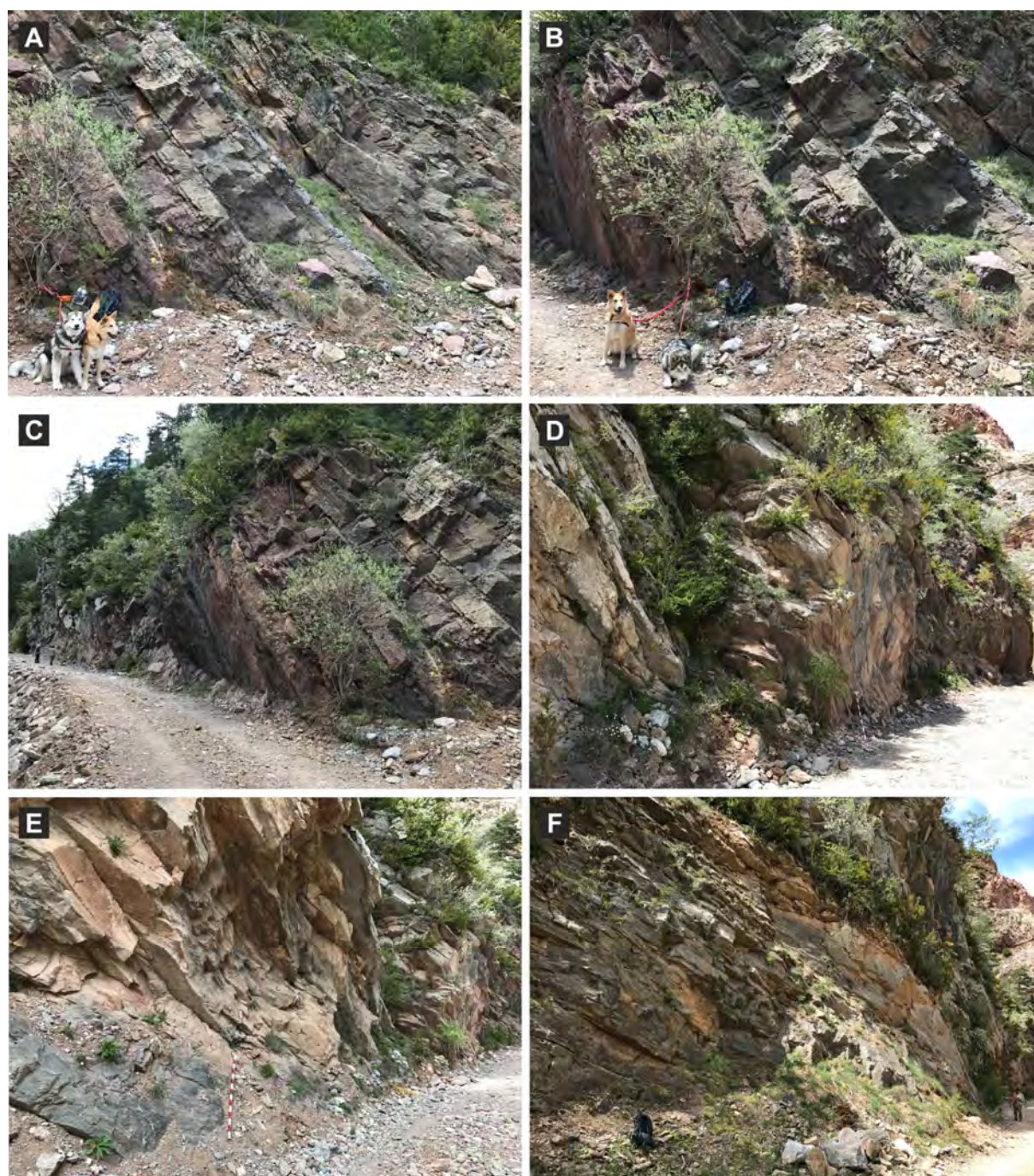


Figure 2. General view and details of the Pi section. **A.** Comabella Fm/Villech Fm. contact. **B.** Lower part of Villech Fm. **C.** General view of Villech Fm. **D.** Villech Fm./Barousse Fm. contact. **E.** Lower part of Barousse Fm. **F.** Devonian/Carboniferous transition interval in the Barousse Fm.

Palaeoenvironment

The sediments represent hemipelagic condensed limestones that were deposited in a carbonate platform. Sanz-López (2002) suggested that La Mena Fm. was deposited in a hemipelagic condensed carbonate ramp, which changed to a deep carbonate ramp with a low subsidence rate at the beginning of the Barousse Fm.

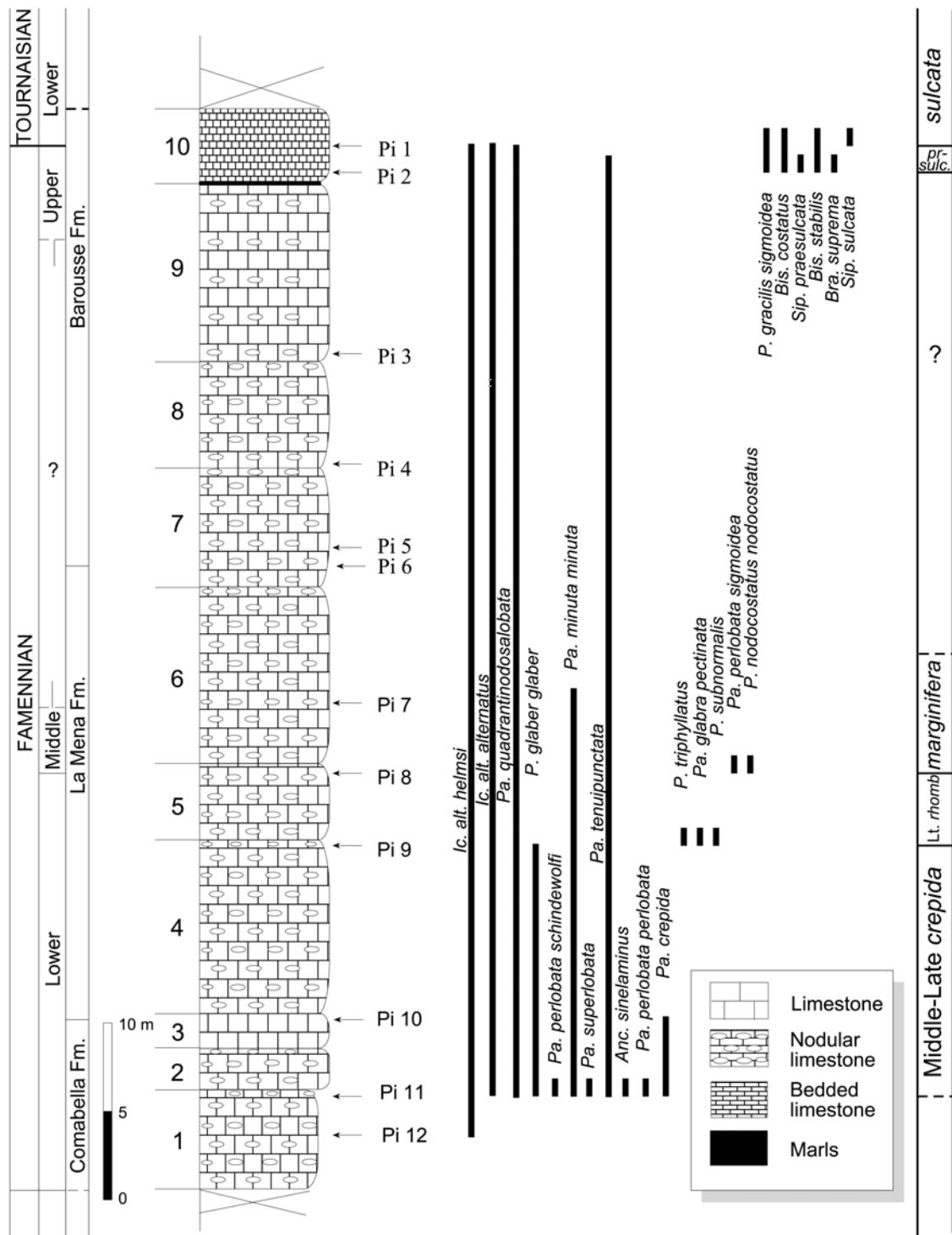


Figure 3. Stratigraphic column of the Pi section and conodont distribution.

Figure 4. Conodonts from the Pi section. All scale bar x200.

1. *Icriodus alternatus* Branson & Mehl, I element, oral view, sample Pi11. 2. *Palmatolepis crepida* Sannemann, Pa element, oral view, sample Pi11. 3. *Palmatolepis minuta minuta* Branson & Mehl, Pa element, oral view, sample Pi11. 4. *Ancyrognathus sinelamina* Branson & Mehl, Pa element, oral view, sample Pi11. 5. *Palmatolepis perlobata perlobata* Ulrich & Bassler, Pa element, oral view, sample Pi11.

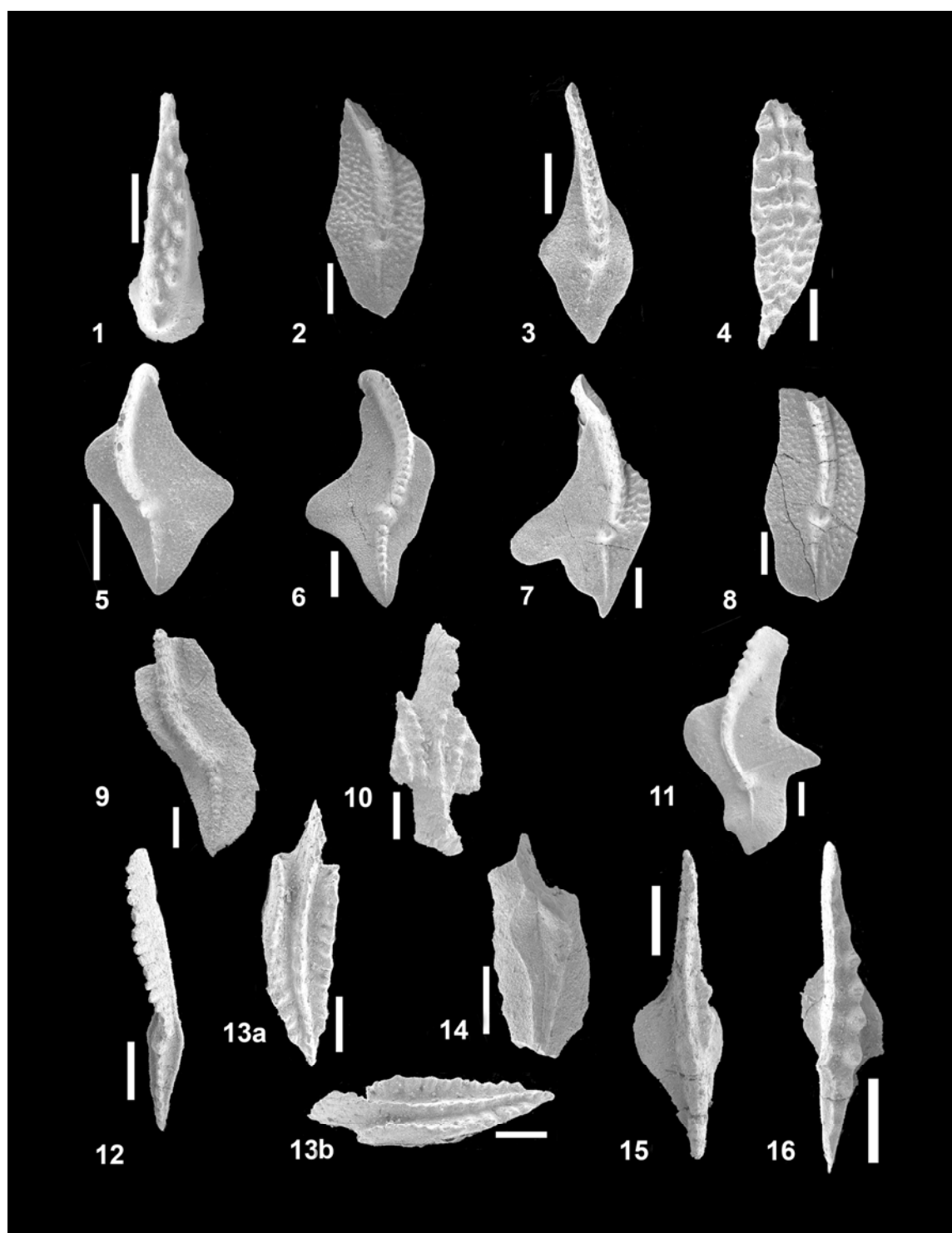


Figure 4. continued.

6. *Palmatolepis tenuipunctata* Sannemann, Pa element, oral view, sample Pi11. **7.** *Palmatolepis quadrantinodosalobata* Sannemann, Pa element, oral view, sample Pi10. **8.** *Palmatolepis crepida* Sannemann, Pa element, oral view, sample Pi10. **9.** *Palmatolepis glabra pectinata* Ziegler, Pa element, oral view, sample Pi9. **10.** *Polygnathus triphyllatus* Helms, Pa element, oro-lateral view, sample Pi9. **11.** *Palmatolepis perlobata sigmoidea* Ziegler, Pa element, oral view, sample Pi8. **12.** *Palmatolepis gracilis sigmoidea* Ziegler, Pa element, oral view, sample Pi2. **13.** *Siphonodella sulcata* group Huddle, Pa element, 13a oral view, 13b oro-lateral view, sample Pi1. **14.** *Siphonodella sulcata* group Huddle, Pa element, aboral view, sample Pi1. **15.** *Bispathodus costatus* Branson, Pa element, oral view, sample Pi1. **16.** *Bispathodus costatus* Branson, Pa element, oral view, sample Pi1.

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Fossil content

12 conodont samples have been collected from the Pi section (Fig. 3) from selected limestone beds. Abundance is moderate to high and two samples were barren. The preservation is moderate. Conodont colour is black corresponding to a Color Alteration Index (CAI) of 5.

23 taxa belonging to five genera (*Polygnathus*, *Icriodus*, *Bramehla*, *Palmatolepis* and *Siphonodella*) have been identified (Figs. 3, 4).

Biostratigraphy

The association recorded in sample 11 restricted this level to a narrow interval between the Middle and Upper *crepida* Zones of Ziegler & Sandberg (1990) or the new *Pa. termini* and *Pa. gl. prima* Zones of Spalletta et al. (2015). The conodont association of sample 9 would indicate the Upper *rhomboidea* Zone or the corresponding *Pa. gr. gracilis* Zone of Spalletta et al., and correlates this level close to the end of the Lower Famennian. Sample 8 contains conodonts of the *marginifera* Zone, without distinction of its further subdivision in Ziegler & Sandberg's zonal scale. Therefore, the lower limit of the Middle Famennian has to be sought between samples 9 and 8, which are 14 meters apart. The next important bio-chronostratigraphical datum is the succession of records within *Siphonodella*. The lowest record of *Siphonodella*, *S. praesulcata*, is in sample 2. The next record in sample 1 corresponds to a different form, formerly identified as *S. sulcata*. Regardless the taxonomic problems linked to *Siphonodella*, these two samples bracket an interval of interest for discussions on the Devonian/Carboniferous boundary.

Additional remarks

Although the conodont study of this section is in a preliminary stage, the data suggest that Famennian strata are well exposed here and, therefore, this section could be relevant for further detailed studies in the Pyrenees in the context of global Famennian subdivision and redefinition of the Devonian/Carboniferous boundary.

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