

## Upper Ordovician conodonts in the Valbertad section

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**Locality** - Along the road connecting Paularo to the Passo del Cason di Lanza, at coordinates N 46°34'31", E 13°8'39".

**Lithostratigraphic unit** - Valbertad Fm., Uqua Fm.

**Age** - Katian-?Hirnantian (Upper Ordovician); Am. ordovicicus Zone.

**What to see** - Type section of the Valbertad Fm.

### How to get there

The Valbertad section can be reached from Passo del Cason di Lanza moving for about 3 km along the road to Paularo. It is located north of the road at altitude 1325 m a few hundred meters west of the place where stood the old Casera Valbertad Bassa (Fig. 1).



**Figure 1.** Location map of the Valbertad section.

### Historical outline

The section was measured in the 970's after the construction of the road, but preliminary data were published only in connection with the ECOS VII congress (Bagnoli et al., 1998). The Valbertad section is the type section of the Valbertad Fm. (Schönlaub & Simonetto, 2015)

### Lithology and fossil content

The Valbertad section exposes about 36 m of Ordovician siltstones, sandstones and limestones of the Valbertad and Uqua formations.

The Valbertad Fm. is here 34 m thick and consists of siltstones and sandstones; about 25 m from the base of the section a few cm-thick nodular fine-grained calcareous lenses began to appear in concentrated intervals alternating with sandstones. Fossil are relatively abundant within the unit: brachiopods and bryozoans are common, whereas trilobite and corals (Tabulata) are rare, and gastropods and conulariids very rare; cystoids are abundant in the central part of the section, mainly

between levels 6 and 7. In addition, the Valbertad Section has provided the first evidence of Edrioasteroidea in the Ordovician of the Carnic Alps (Bagnoli et al., 1998). A few trace fossils and bioturbations are also present.

The uppermost 2 m of the section belong to the Uqua Fm., and are represented by nodular micritic limestone.



**Figure 2.** Views of the Valbertad section. **A.** Panoramic view from the base of the section. **B.** Detail of the upper part.

### Palaeoenvironment

The Valbertad Fm. deposited in a silicoclastic tidal flat.

### Conodonts

Twenty calcareous levels were collected from the Valbertad section by Bagnoli et al. (1988), being reactive only the upper part (levels 11 to 19). Samples were prepared in acetic acid, concentrated with sodium-polytungstate and sieved with a 180  $\mu$  sieve. Conodont abundance is extremely variable, with maximum richness in the topmost exposure (level 19). Elements described by Bagnoli et al. (1988) are generally well preserved, but extremely fragile and generally very small, with Colour Alteration Index (CAI) of 3-4, indicating a burial temperature of at least 110 to 190°C. Nineteen species belonging to eighteen genera were documented in the Valbertad section (Fig. 3).

The composition of the conodont fauna of the Valbertad section closely matches that reported by Serpagli (1967) from M. Zermula and Rifugio Nordio (about respectively 3 km SE and 26 km E from the Valbertad section) and preliminarily revised in multielement taxonomy by Sweet and Bergström (1984). Nevertheless, species frequency and relative proportion of constituent elements inside apparatuses are strongly diverse, since the Valbertad material is composed almost exclusively of small individuals.

Elements of *Nordiodus italicus* and *Acodus trigonius* s.f. are dominant. Other abundant species are *Plectodina alpina*, *Scabbardella altipes* and *Decoriconus minutus*. Serpagli's material was dominated by *S. altipes* and *H. brevirameus*. The latter species is represented by some ramiform elements and extremely rare "drepanodiform" P elements.

A rich fauna of well-preserved brachiopods and phosphatic sclerites attributed to *Milaculum*, as well as ostracodes and sponge spiculae, were reported.

### Biostratigraphy

The described Valbertad species association represents the *A. ordovicicus* Zone and is of late Katian (Ka4) age. The presence of the Hirnantian has not been confirmed.

### Additional remarks

According to Bergstrom & Ferretti (2015, p. 19): "*Dichodella exilis* Serpagli, 1967, the type species of *Dichodella* Serpagli, is a Pa element that certainly shares many of the diagnostic characters of the Pa elements of *Birksfeldia*. *Dichodella* was introduced by Serpagli (1967) as a new genus having morphological features of both *Dichognathus* and *Icriodella* (so the name). It is based on a Pa element with four processes, among which only the anterior and posterior ones are denticulated. One of the two lateral processes has an adenticulated costa. Bagnoli et al. (1988), based on additional collections from the Italian Carnic Alps, regarded *Dichodella exilis* Serpagli as the Pa element of *Birksfeldia*. If this

interpretation is correct, it is obvious that according to priority *Birksfeldia* should be regarded as a junior synonym of *Dichodella*." Bagnoli et al. (1988) also proposed that *Prioniodus ethingtoni* s.f. Serpagli might represent the Pb element. Additional collections are needed to definitely solve also this synonymy problem.

Conodonts recovered from the Valbertad section belong to the HDS (*Hamarodus brevirameus-Dapsilodus mutatus-Scabbardella altipes*) biofacies of Sweet and Bergstrom (1984). The possible gradation to the *Amorphognathus-Plectodina* biofacies suggested by Sweet and Bergstrom (1984) is also indicated by the relative abundance of these two genera in this association. The Valbertad material confirms the special character of the Carnic Alps conodont assemblage inside Southern Europe, being a moderate diverse fauna with typical taxa like *Nordiodus italicus*, *Acodus trigonius* s.f. and *Plectodina alpina*. Distinctive representatives of the high-latitude Mediterranean Province such as *Sagittodontina robusta* and *Istorinus erectus* are here apparently missing.

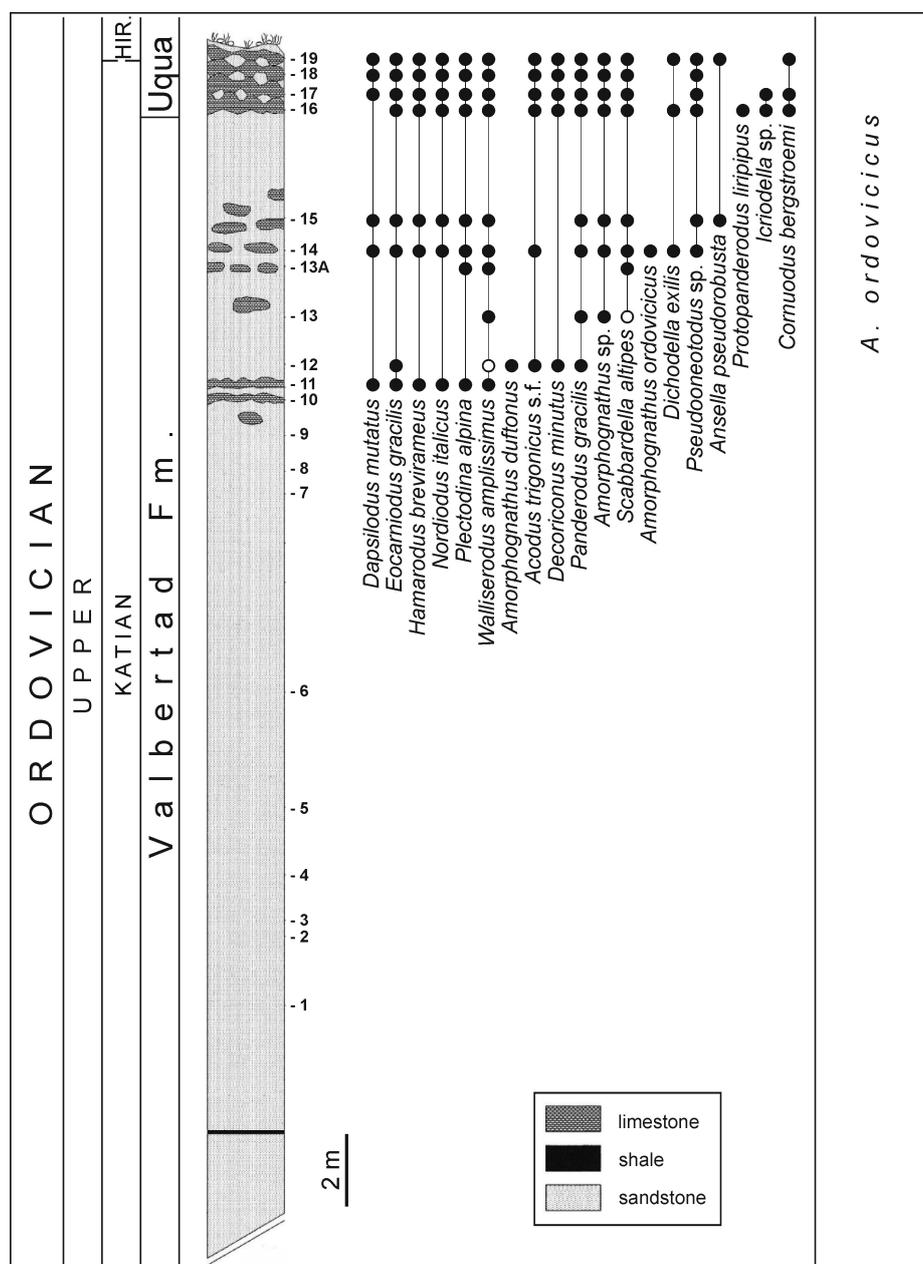
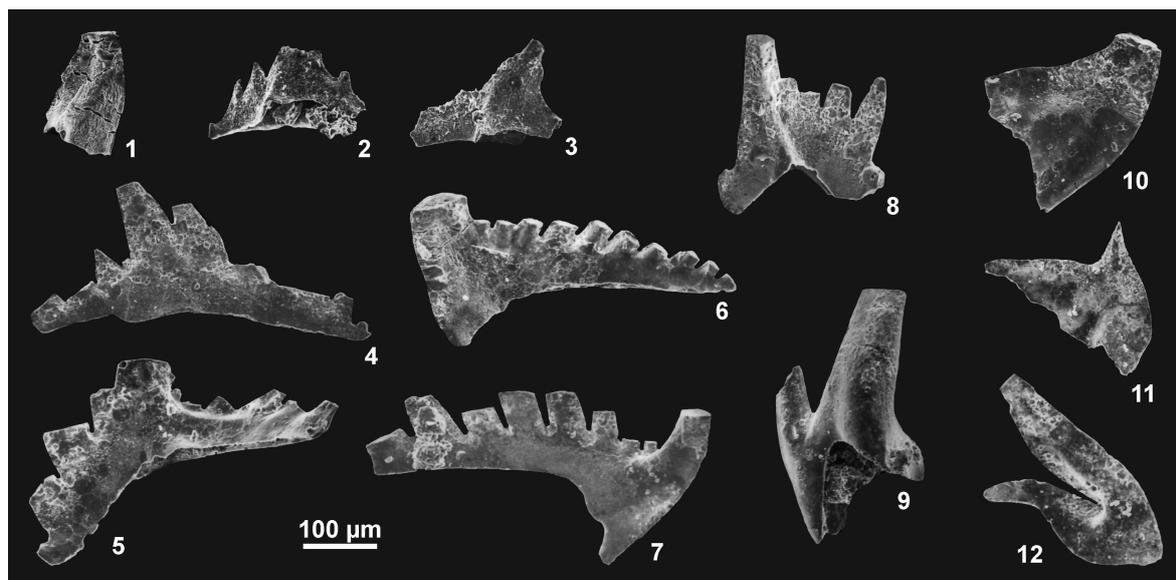


Figure 3. Stratigraphic column of the Valbertad section and conodont distribution (log after Bagnoli et al., 1998).



**Figure 4.** Selected conodonts from the Valbertad section (all refigured after Bagnoli et al., 1998).

1. *Amorphognathus lindstroemi* (Serpagli), postero-lateral view of M element IPUM 26055, sample VLB 14. 2. *Dichodella exilis* Serpagli, lateral view of Pa element IPUM 26066, sample VLB 16. 3. *Dichodella exilis* Serpagli, lateral view of Pa element IPUM 26067, sample VLB 14. 4. *Plectodina alpina* (Serpagli), lateral view of Pa element IPUM 26074, sample VLB 17. 5. *Plectodina alpina* (Serpagli), lateral view of Pb element IPUM 26076, sample VLB 19. 6. *Plectodina alpina* (Serpagli), lateral view of M element IPUM 26078, sample VLB 19. 7. *Plectodina alpina* (Serpagli), lateral view of Sc element IPUM 26077, sample VLB 16. 8. *Plectodina alpina* (Serpagli), lateral view of Sb element IPUM 26079, sample VLB 19. 9. *Amorphognathus ordovicicus* Branson & Mehl, antero-lateral view of M element IPUM 26054, sample VLB 12. 10. *Nordiodus italicus* Serpagli, lateral view of Pa element IPUM 26061, sample VLB 19. 11. *Nordiodus italicus* Serpagli, lateral view of Pb element IPUM 26063, sample VLB 19. 12. *Nordiodus italicus* Serpagli, lateral view of M element IPUM 26065, sample VLB 19.

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