Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 23	Valencia 2017
International Conodont Symposium 4	Valencia, 25-30th June 2017		

Late Eifelian to early Givetian conodonts of the Zuc di Malaseit Basso (ZMB) section

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Locality *- Along path 435 west of Zuc di Malaseit, at coordinates N 46°33'19.6", E 13°11'10.6".*
Lithostratigraphic unit *- Hoher Trieb Fm.*
Age *- Eifelian-Givetian (Middle Devonian);* T. kockelianus australis *Zone to* P. ansatus *Zone.*
What to see *- Black shale and chert layers across the Eifelian-Givetian boundary.*

How to get there

The ZMB section can be reached along the road from Pontebba to Passo del Cason di Lanza. The section is located along a small hiking path on the NE slope of Zuc di Malaseit which starts from a car park a few km before reaching Cason di Lanza (Fig. 1).

Figure 1. Location map of the Zuc di Malaseit Basso section.

Historical outline

The section has been selected as reference section of the Hoher Trieb Formation (Pondrelli et al. 2015a). Regional geological settings, stratigraphic correlation and research on the depositional environment are performed by Pondrelli et al. (2015b). A detailed study on conodont diversity across the Eifelian-Givetian boundary of that section is published by Suttner et al. (2017).

Lithology and fossil content

The section has a total thickness of about 15 m and exposes an overturned sequence of rocks belonging to the Hoher Trieb Formation (Pondrelli et al., 2015a). Two several meters thick limestone breccia levels are recognized at the stratigraphic base of the section and at its top. Limestone breccias are composed of lithoclasts of peloidal grainstone, stromatoporoids, corals, brachiopods and crinoid stem plates. The interval between the two breccia levels consists mainly of limestone beds which are intercalated by chert layers either on top or base of single limestone beds or chert nodules.

Figure 2. View of the ZMB section with location of conodont samples across the Eifelian-Givetian boundary.

Some chert-rich intervals consist of argillaceous, dark brown organic-rich grainstone with layers of recrystallized skeletal grains and radiolarians. Especially during the *ensensis* and *hemiansatus* Biozone interval limestone beds are intercalated by siltstone layers. Some of these are organic-rich with a high clay content and yield crinoidal stem plates. Additionally, laminated carbonaceous siltstones occur that yield some few ostracod valves, broken tentaculitids, crinoids and calcispheres. Limestone beds mainly consist of peloidal grainstone with crinoids and sometimes Parathuramminoidea, ostracods, bryozoans and calcispheres.

Palaeonvironment

The Hoher Trieb Formation was formed at the toe-of-slope of a carbonate apron (Pondrelli et al., 2015b). Deposits of hyperconcentrated and concentrated density flows and turbidity flows are embedded within a record of pelagic and hemipelagic sediments. The platform-derived carbonates are supplied from a reef environment. Black shales suggest formation under temporary dysoxic and anoxic conditions.

Conodonts

Sixty-one conodont samples have been collected from the ZMB section (Fig. 3). Some of the samples yield quite abundant and well preserved specimens. Only few samples taken from the shales are barren of conodonts.

Conodont color is dark brown, corresponding to a Color Alteration Index (CAI) of 4.

Thirty-eight taxa belonging to ten genera (*Belodella*, *Dvorakia*, *Panderodus, Neopanderodus, Icriodus*, *Oulodus*, *Pseudooneotodus*, *Ozarkodina*, *Tortodus* and *Polygnathus*) have been identified (Fig. 3).

Biostratigraphy

The lowermost samples collected from the section yield specimens of *Polygnathus benderi* and *Tortodus kockelianus australis* (samples ZMB 12/BR3; ZMB 12/BR2; ZMB 12 D). *Tortodus kockelianus kockelianus* enters a little higher and first occurs in sample ZMB 12 D. The first

occurrence of *T. k. kockelianus* suggests that the breccia level at the base of the section was deposited still within the *australis* Biozone (Fig. 3). From sample ZMB 12 D upward a quite long-lasting *kockelianus* Biozone is recognized until the entry of platform elements very similar to *P. ensensis* (sample ZMB20-2). The *ensensis* Biozone is limited to less than 50 cm by the first occurrence of *P. hemiansatus* gamma morphotype (ZMB12 top). The early Givetian *hemiansatus* Biozone continues until sample 2, when first specimens of *Polygnathus timorensis* are found. The *timorensis* Biozone is very short and extends only until sample ZMB4E top, when *Polygnathus rhenanus* and *Polygnathus varcus* enter. The *rhenanus* Biozone lasts nearly until the top of the measured section, when first specimens of *Polygnathus ansatus* occur which indicate the onset of the *ansatus* Biozone (ZMB 12/2 and ZMB 12/1).

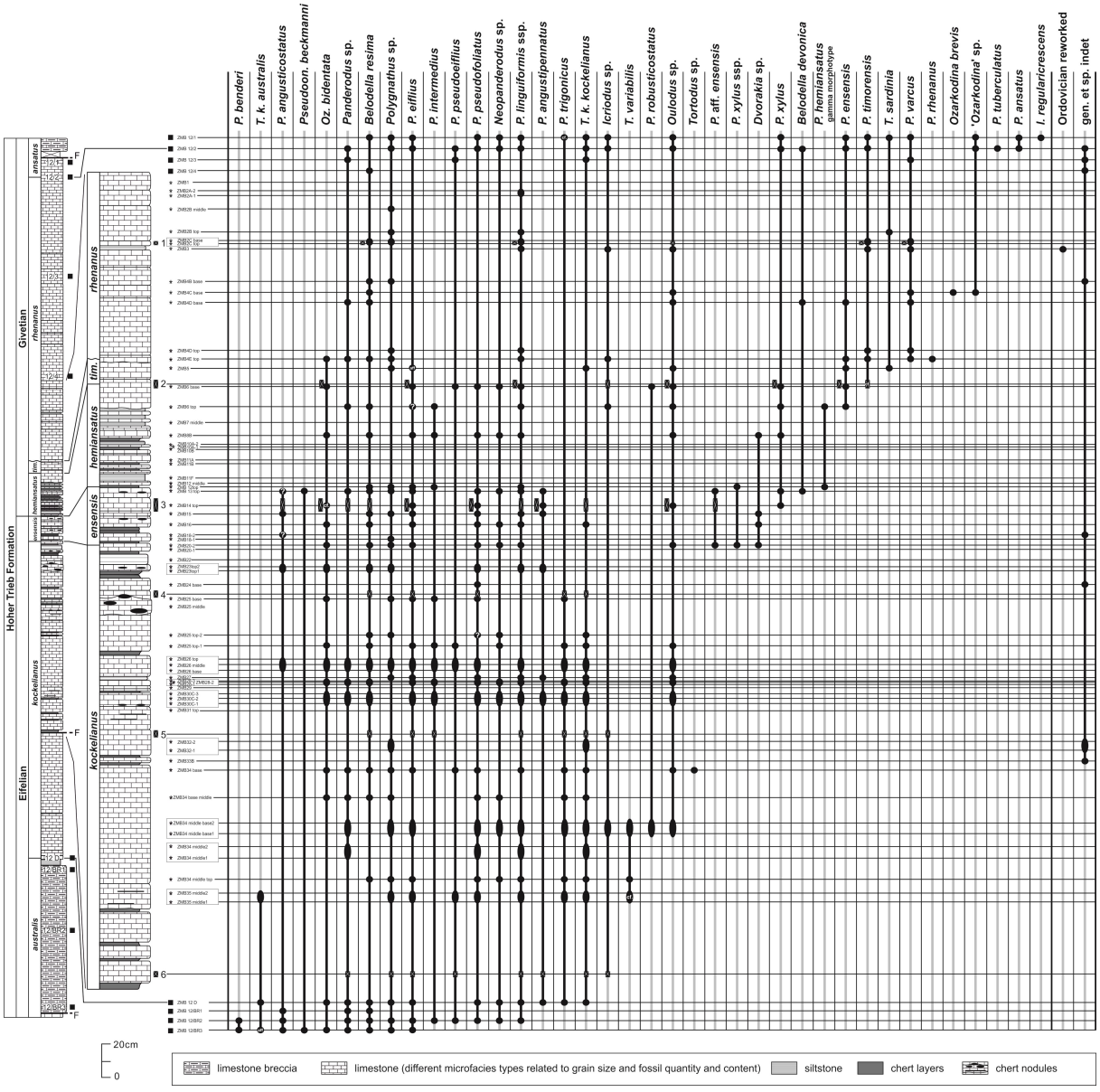

Figure 3. Stratigraphic column of the ZMB section and conodont distribution (modified after Suttner et al., 2017).

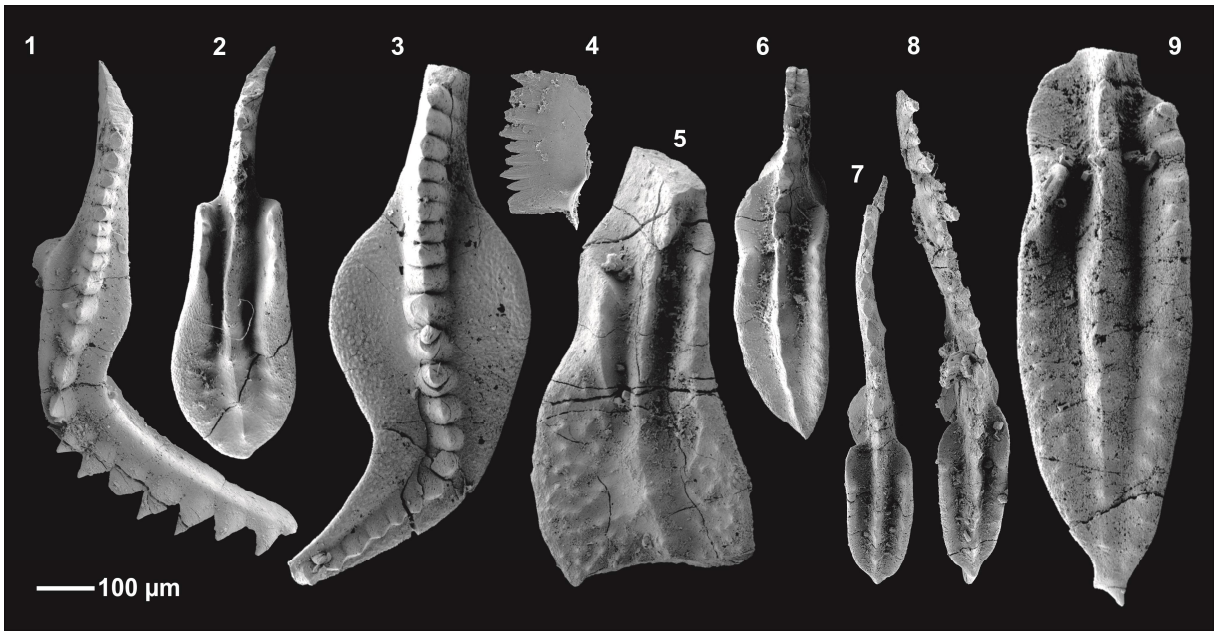

Figure 4. Conodonts from the ZMB section (refigured after Suttner et al., 2017).
1. *Tortodus kockelianus australis* (Jackson), P1 element, MFSNgp 48161/14, oral view, sample ZMB 12 D. **2.** *Polygnathus ensensis* Ziegler & Klapper, P1 element, MFSNgp 48162/18, oral view, sample ZMB6 base. **3.** *Tortodus kockelianus kockelianus* (Bischoff & Ziegler), P1 element, MFSNgp 48161/27, oral view, sample ZMB 28. **4.** *Ozarkodina brevis* Bischoff & Ziegler, P1 element, MFSNgp 48163/15, lateral view, sample ZMB 4C base. **5.** *Polygnathus hemiansatus* gamma morph Bultynck, P1 element, MFSNgp 48162/14, oral view, sample ZMB6 top. **6.** *Polygnathus ansatus* Ziegler & Klapper, P1 element, MFSNgp 48162/42, oral view, sample ZMB 12/1. **7.** *Polygnathus varcus* Stauffer, P1 element, MFSNgp 48163/13, oral view, sample ZMB 4E top. **8.** *Polygnathus rhenanus* Klapper, Philip & Jackson, P1 element, MFSNgp 48163/14, oral view, sample ZMB 4E top. **9.** *Polygnathus timorensis* Klapper, Philip & Jackson, P1 element, MFSNgp 48162/30, oral view, sample ZMB 4E top. - All specimens relate to the 100 µm scale bar.

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