Stop 3: The Seewarte Section

by
Hans P. Schönlaub & Lutz H. Kreutzer

The oldest rocks of the Seewarte section are best exposed near the Valentin Törl (= Pass), a few meters to the west of the southern pass at an altitude of 2100 m (H.P. SCHÖNLAUB 1971, 1980).

The Ashgillian and Silurian part of this section represents a transitional facies between the Plöcken facies and the Wolayer facies. In the Ashgill neither the typical Uggwa Lst. nor the typical Wolayer Lst. are developed. Similarly, the Silurian is characterized by an intermediate facies of crinoid-brachiopod bearing limestones instead of the brownish nautiloid bearing Kok Lst.

At the base of the Silurian iron-manganese bearing black shales and Fe-Mn enriched hardground layers occur suggesting a condensation horizon which can also be inferred from the basal Silurian conodont fauna.

The fauna from the Ordovician limestone below indicates a coeval age with the Uggwa Lst. at Cellon as well as from other places in the Carnic Alps (E. SERPAGLI 1967). Although all elements of the multi-element of *Amorphognathus ordovicicus* have been found, the fauna is dominated by single cones such as *Acodus similaris, Oistodus niger* and *Distomodus europaeus.*

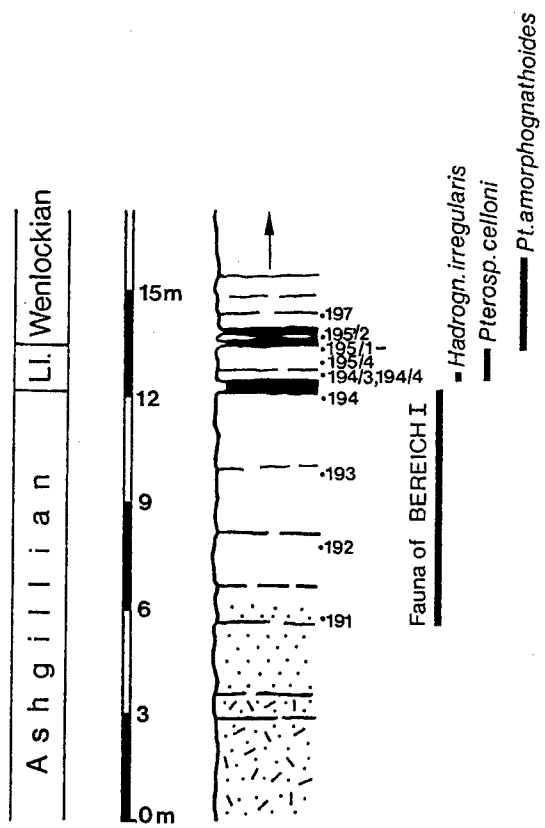

Fig. 14. Ordovician/Silurian boundary beds at the base of Mount Seewarte (from H. P. SCHÖNLAUB 1971).

The basal Silurian conodont fauna is mentioned in Fig. 14. Diagnostic elements indicate the presence of the *P. celloni* Zone (Upper Llandovery, Telychian) and the following *P. amorphognathoides* Zone at the passage from the Llandovery to the Wenlock. As at Cellon the corresponding sediments of the Lower and the major part of the Middle Llandovery are missing.

As far as the thickness is concerned the succeeding Wenlock and Ludlow sequence resembles the Cellon section. For example the equivalent of the Kok Lst. reaches a thickness of 12 m in comparison to 13,5 m at the Cellon section.

The main difference, however, is the lithology which reflects a more shallow environment dominated by crinoids and small brachiopods which have not yet been studied in detail.

At this locality the Silurian/Devonian boundary beds are not exposed. Instead, they are developed some 300 m to the west at the footwall of the Seewarte cliff near Lake Wolayer in a small ravine a few meters above the trail. The remaining section has a full exposure ranging through the Devonian to the Dinantian.

According to the "classical" studies of K. BANDEL 1969 and G. B. VAI 1967, 1971, 1977 (in H. W. FLÜGEL et al. 1977) the transition from the Silurian to the Devonian occurs in a very uniform facies. In fact, the boundary is defined only on paleontological evidence based on conodonts, brachiopods and trilobites.

The Megaerella Fm. of the Pridoli consists of greyish to blackish, medium to well-bedded crinoidal limestones in which fossils are rather rare. Index fossils are the conodont species *O. r. eosteinhornensis* and the brachiopods *Dubaria megaerella* and *Gracianella umbra*. The boundary itself can be drawn within a 7m-interval between sample nos. B298 and FV140.

The following subdivision of the Devonian sequence is based on detailed lithologic studies of K. BANDEL 1969, 1972, G. B. VAI 1967, 1971, S. POHLER 1982 and L. H. KREUTZER 1992a,b (see Figs. 15, 16). With regard to faunal and floral occurrences and their biogeographic significance we refer to the summary remarks of H. P. SCHÖNLAUB (1992).

The Lochkovian part of the Devonian succession represents the neritic Rauchkofel Limestone. This unit comprises interbedded coarse-bedded, greyish and partly dolomitized fossiliferous crinoidal limestones and greyish to black well-bedded pelletoidal limestones. Locally small patch-reefs occur for the first time. The faunal content is listed in the accompanying figure.

The neritic Rauchkofel Lst. grades into the 350 m thick massive Hohe Warte Limestone of Pragian to Lower Emsian age representing the southern shallow-water facies of L. H. KREUTZER (1992). It comprises light grey bioclastic to biohermal crinoidal limestones of the fore-reef and reef-core environment. This formation is locally very fossiliferous consisting mainly of frame-building organisms such as echinoderms, brachiopods, corals, stromatoporoids, algae, trilobites and gastropods (G. B. VAI 1967, 1973, K. BANDEL 1969).

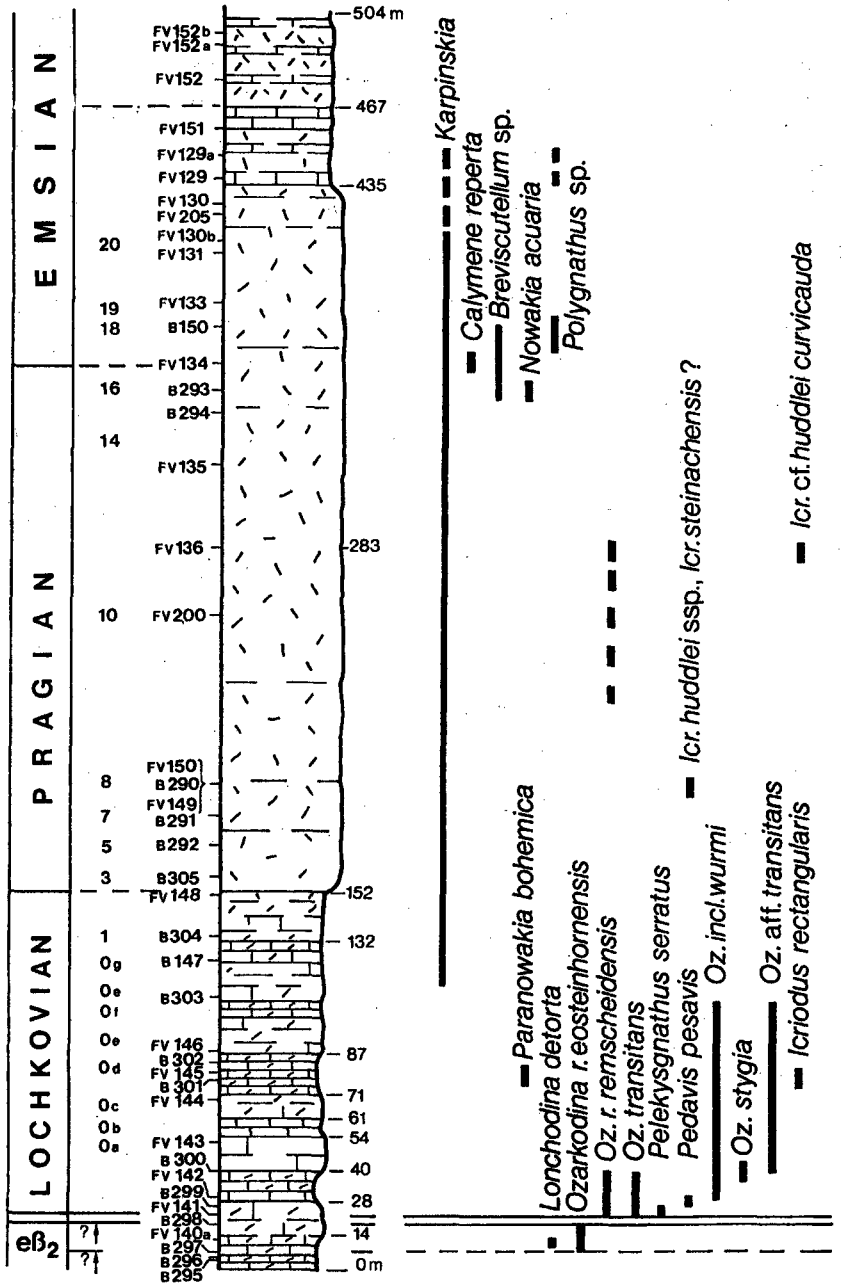

Fig. 15. The Lower Devonian section along the base of the northwestern cliff of Mount Seewarte (from G. B. VAI 1973, modified).

Fairly abruptly, the Hohe Warte Lst. is succeeded by the 40 m thick Seewarte Lst. (formerly named "Hercynella-Kalk") of Lower Emsian age. It consists of black bituminous algae, gastropod, bivalve and coral-bearing limestones being deposited in a restricted back-reef setting atop the former reefal development.

The following 130 m thick Upper Emsian Lambertenghi Lst. represents interbedded fenestral, grey limestones, reworked crinoidal limestones and microbial laminites. The skeletal grains consist of algae, gastropods, ostracods and parathuramminaceae in the laminites and bivalves, gastropods, corals, stromatoporoids and dasycladaceae in the organodetritic layers. Most probably it was deposited in a restricted subtidal and intertidal platform setting.

The overlying 220 m thick Spinotti Limestones of Eifelian to Lower Givetian age represents interbedded fenestral "birdseye"-type limestones, beds with debris of crinoids and Amphipora-bearing limestones. Fossils consist of bivalves, gastropods, echinoderms, amphiporids, stromatoporoids, corals, brachiopods and dasycladaceae. The Spinotti Lst. was formed in a temporary well agitated back-reef setting.

The top of the Seewarte cliff is formed by the more than 180 m thick Kellergrat Reef Limestone of Givetian to Frasnian age. It represents the repetition of the Devonian reef consisting of massive fossiliferous framestones and bafflestones with abundant stromatoporoids, corals, brachiopods, gastropods, echinoderms, calcispheres and *Renalcis turbidus*. According to L. H. KREUTZER the reef development ended in the Lower gigas conodont Zone.

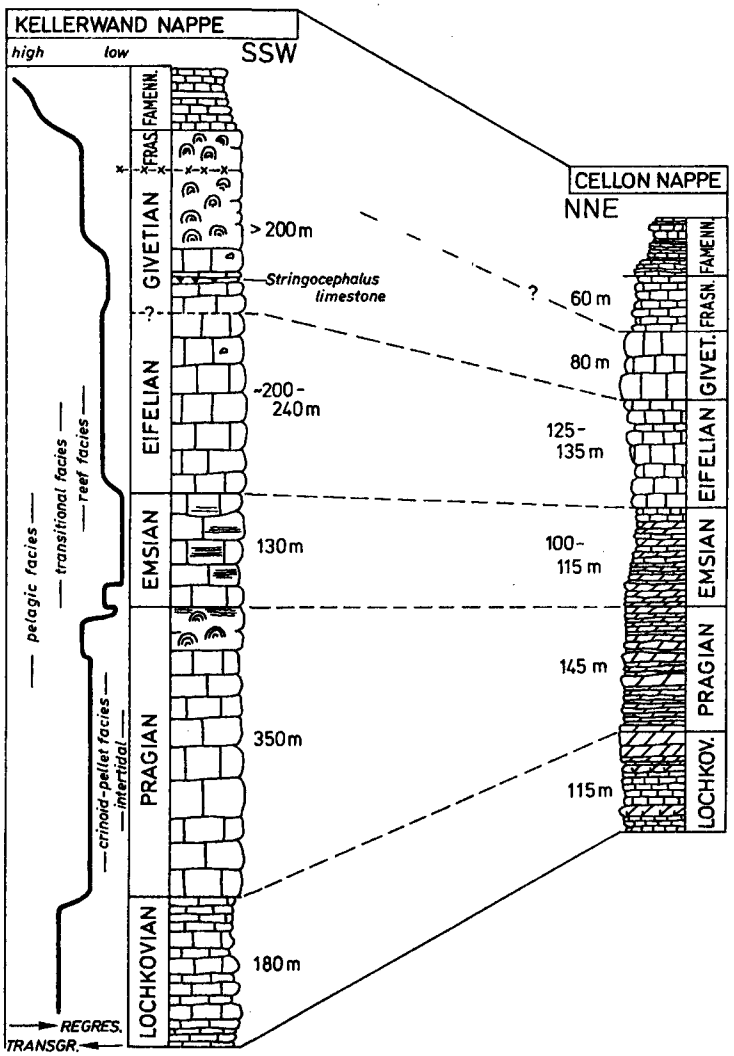

Fig. 16. Comparison of the Devonian sequences between the Kellerwand (Hohe Warte) and the Cellon Nappes (after L. H. KREUTZER 1990, modified).

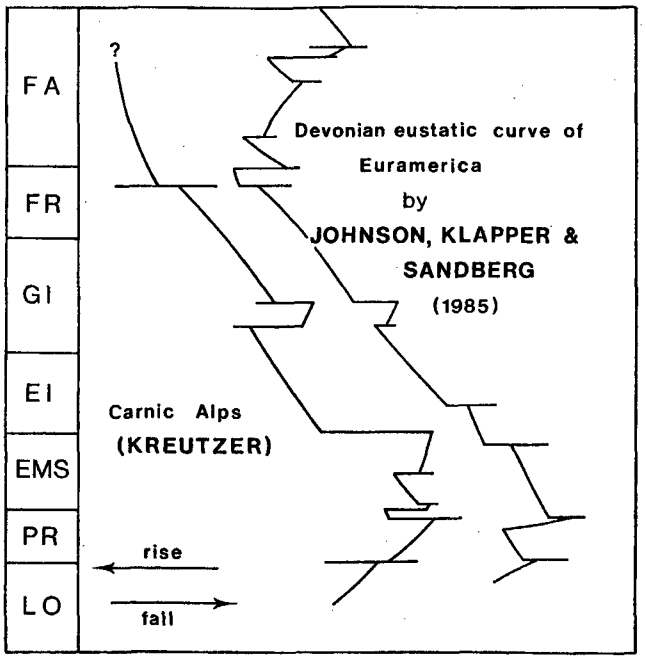

Fig. 17. Eustatic sea-level curve for the Devonian of Euramerica (simplified, after JOHNSON et al. 1985) and of the Carnic Alps (after L. H. KREUTZER 1990). Note similarity between the two curves except for the Upper Devonian.

The above mentioned reef limestones are locally overlain by the Marinelli and Kollinkofel Limestones, respectively, representing up to some 50 m thick shallow water crinoidal and rhynchonellid limestones of uppermost Frasnian to Famennian age.

So far, at this southern block any equivalents of the upper Famennian are apparently missing. Instead, the above mentioned strata are disconformably overlain by cephalopod and trilobite-bearing limestones of Lower Carboniferous age. Based on rich occurrences of fossils at the Plotta section on the Italian side of the mountain chain H. P. SCHÖNLAUB & L. H. KREUTZER 1993 concluded a lowermost Visean age for the uppermost limestone beds documenting thus the end of the continuous deposition of lime in the Variscan sequence of the Carnic Alps (Fig. 18).

This limestone sequence of the Plotta section is unconformably overlain by the cherty Plotta Formation which presumably represents a fossil soil. This horizon represents the base of the Southalpine equivalents of the Culm named here Hochwipfel Formation. Deposition of this siliciclastic sequence started in the Visean and may have lasted during the Serpukhovian and the major part of the Bashkirian.

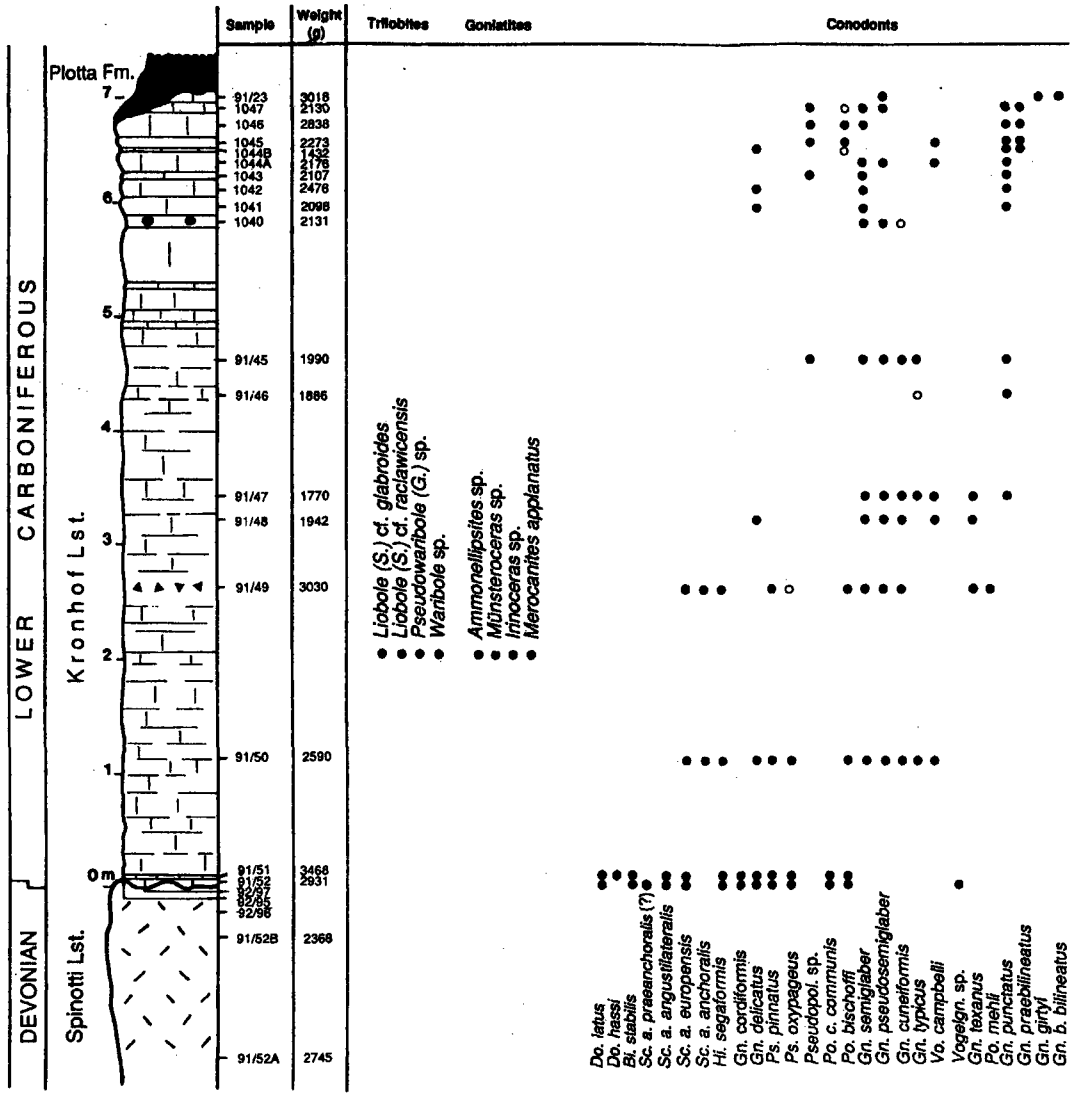

Fig. 18. Distribution of trilobites, goniatites and conodonts from the Kronhof Limestone at the Cima di Plotta section (after H. P. SCHÖNLAUB & L. H. KREUTZER 1993).

Stop 4: Wolayer "Glacier" Section

by

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This locality is located halfway between Valentintörl and Lake Wolayer where the south-dipping Devonian strata are exposed forming a 20 m high cliff. The whole section reflects a strongly condensed sequence of pink nodular and greyish-reddish Flaser limestones commonly named cephalopod limestones. They have been deposited in a pelagic off-shore environment testified by radiolarians, forams, dacryoconarids, styliolinids, ostracods, conodonts, trilobites and few goniatites.