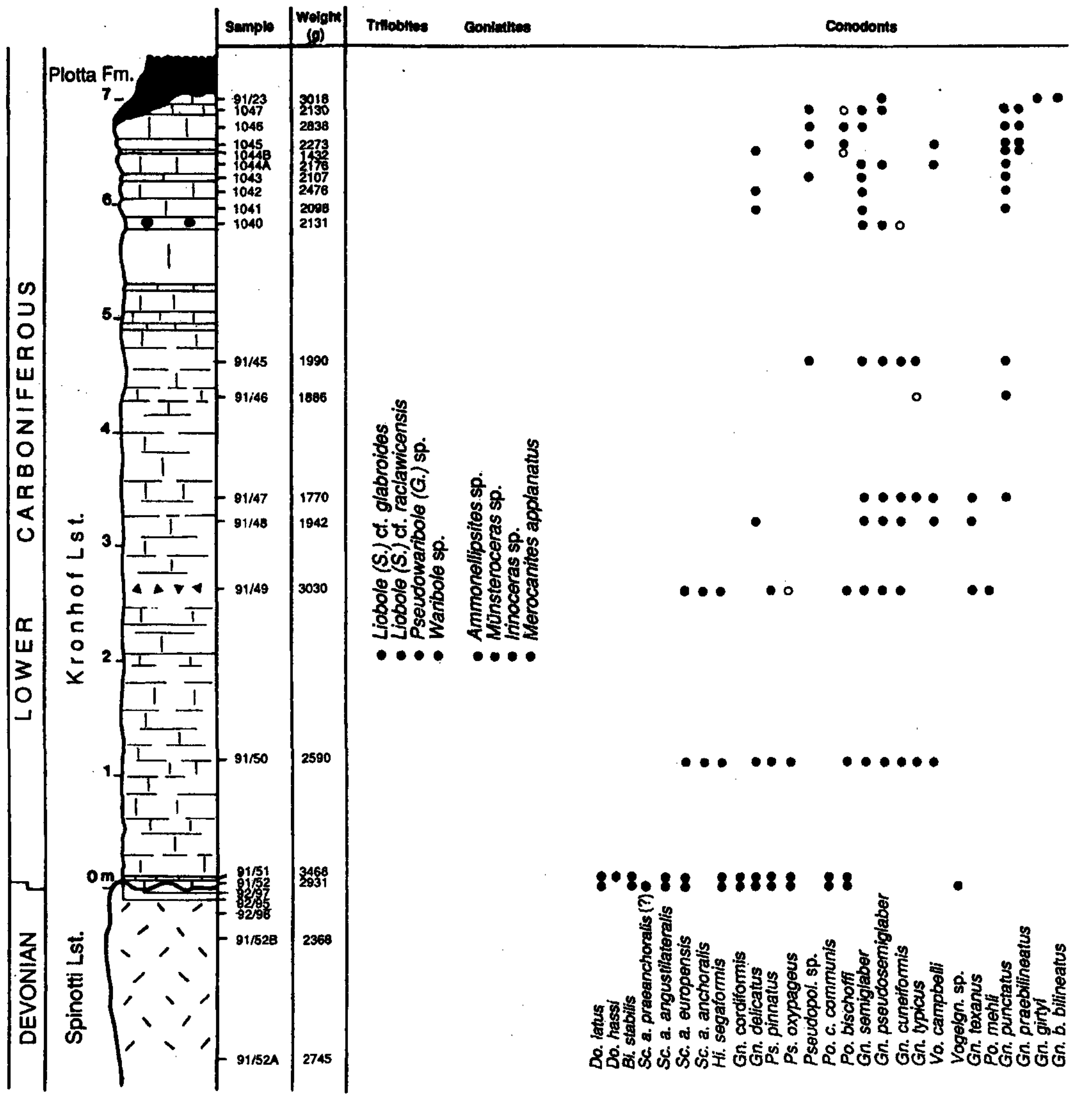


Fig. 18. Distribution of trilobites, goniatites and conodonts from the Kronhof Limestone at the Cima di Plotta section (after H. P. SCHÖNLAUB & L. H. KREUTZER 1993).

Stop 4: Wolayer "Glacier" Section

by

Hans P. Schönlaub, M. M. Joachimski, W. Buggisch & T. Anders

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.

The continuous section ranges from the Emsian to the Famennian. Of particular interest is the Frasnian/Famennian boundary the sedimentology, conodont stratigraphy and isotope geochemistry of which has been studied by B. GÖDDERTZ (1982), H. P. SCHÖNLAUB (1980, 1985, Fig. 19) and M. M. JOACHIMSKI et al. (1994, Fig. 20).

According to these authors the lower part of the so-called Valentin Lst. comprises styliolinid-rich wackestones with fragments of echinoderms, brachiopods, gastropods and trilobites. Larger clasts are coated by Fe-Mn crusts indicating reduced sedimentation. In particular, the Givetian/Frasnian boundary interval is characterized by a distinct horizon of nodular phosphorite. In contrast, the boundary between the Emsian and Eifelian, i. e., the Lower/Middle Devonian boundary, is within a uniform cephalopod limestone development. Based on conodonts it is placed at the bedding plane between sample nos. 28 and 29.

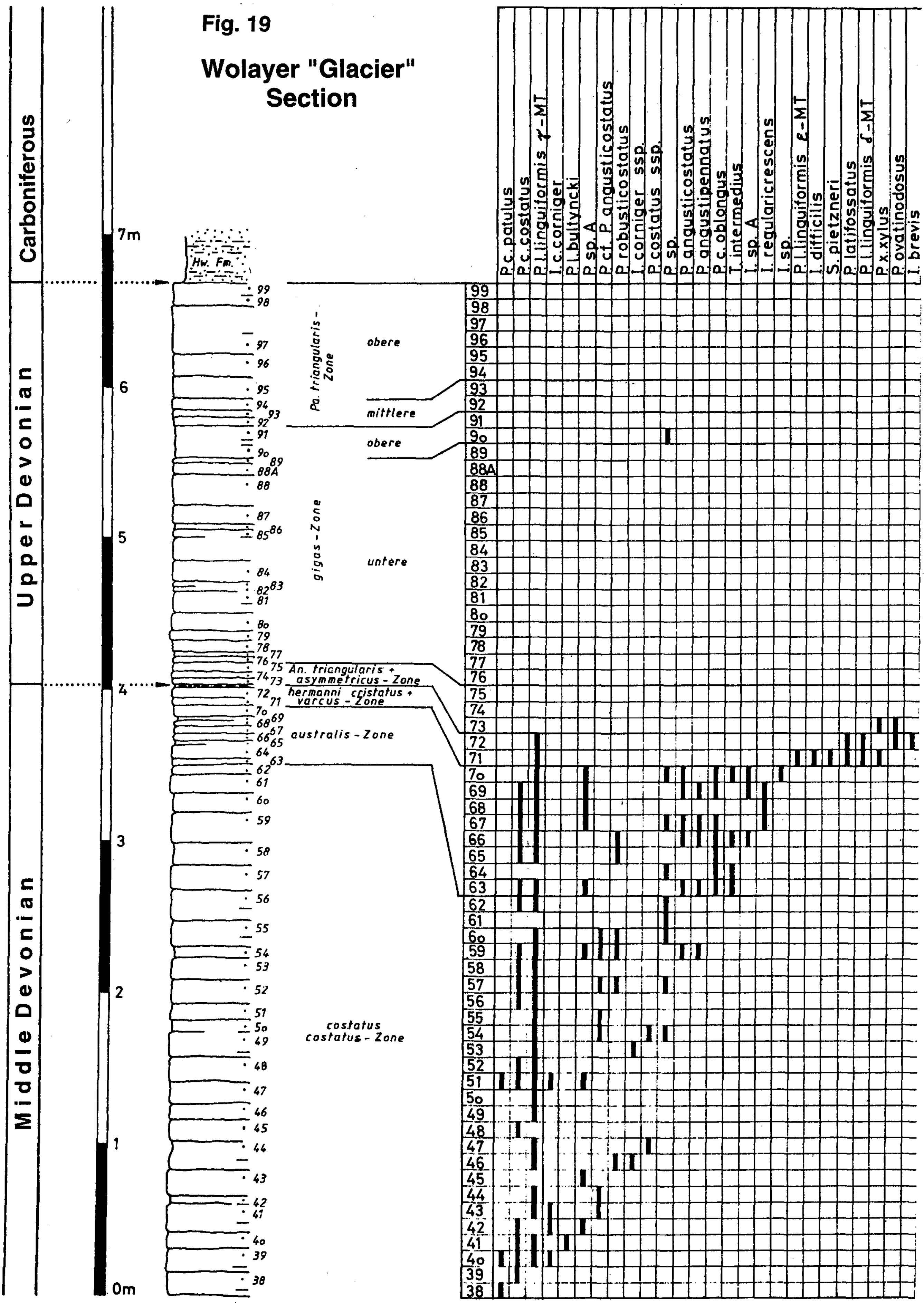
The Pal Lst. of Frasnian age is characterized by mudstones to wackestones with fragments of bivalves, ostracods, echinoderms, trilobites and rare occurrences of corals and styliolinids. Thin biosparitic and quartz-rich layers suggest distal turbidites. Of special interest is an up to 6 cm thick black shale horizon interpreted as an equivalent of the Lower Kellwasser Horizon (M. M. JOACHIMSKI et al. 1994). However, at this section bituminous limestones are missing. Instead, well oxygenated conditions with bioturbation are documented across the Frasnian/Famennian boundary rendering this section as an example for uniform limestone deposition at this critical interval of global importance.

The carbon isotope signatures are shown in the lithologic column (Fig. 19). At the base of the studied section the $\delta^{13}C$ values range from +1.5‰ to + 1.9‰. Carbon isotope values in the Lower Frasnian are around +1‰ with a sharp drop in the Late hassi conodont Zone. A distinct positive excursion occurs in the late Early rhenana Zone. Most enriched values of +3.3‰ are found below the black shale horizon corresponding to the Lower Kellwasser Horizon. In the overlying beds the signal shifts back to Frasnian background levels. A second positive excursion starts below the Frasnian/Famennian boundary with most enriched $\delta^{13}C$ values around +3.1‰ some cm above the boundary. During the Lower Famennian these values gradually shift back to lighter values. According to M. M. JOACHIMSKI & W. BUGGISCH (1993) this characteristic twofold pattern can be recognized in many boundary sections around the globe.

With regard to the isotope signal the Wolayer Glacier profile represents a key section. Although anoxic sediments are missing at the F/F boundary the positive $\delta^{13}C$ excursion can clearly be recognized. Consequently, it may be concluded that these isotope excursions are valid on a global scale independent of anaerobic conditions. The positive excursions are explained by changes in the isotopic composition of the marine total dissolved carbon (TDC). The extension of the oxygen minimum zone during a short-term sea-level rise is thought to be responsible for the enhanced deposition of ^{12}C-enriched organic matter of the Kellwasser Horizons. This is recorded by the positive carbon isotope shift. The subsequent negative excursion is explained by erosion and oxidation of previously deposited organic carbon during sea-level fall. In addition, the withdrawal of large amounts of carbon from surface waters will also affect the atmospheric pCO_2 and thus result in climatic alterations with severe

Fig. 19

Wolayer "Glacier" Section



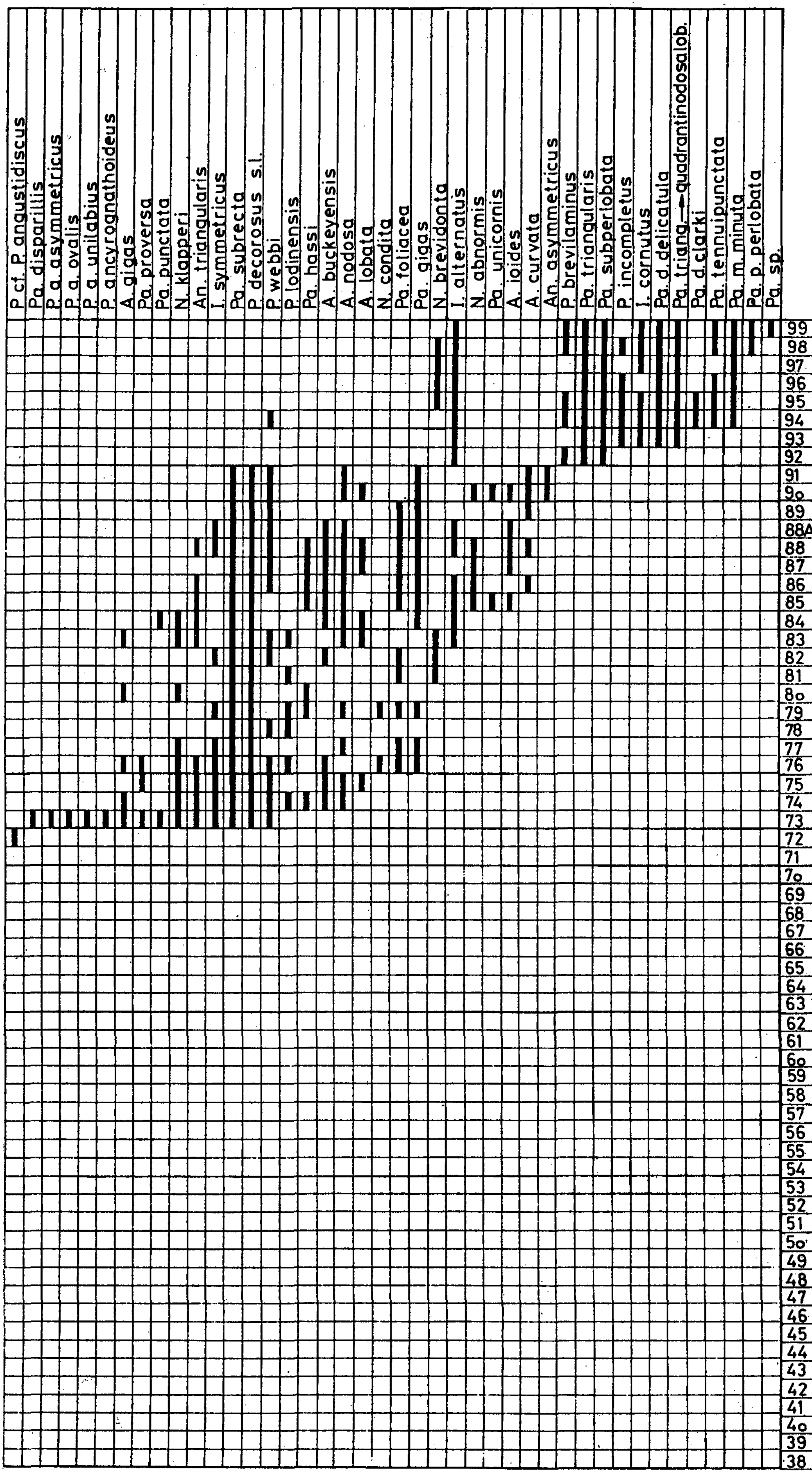


Fig. 19
Wolayer Glacier section.
Distribution of conodonts
in the Valentin and Pal. Lst.
(From B. GÖDDERTZ 1982).

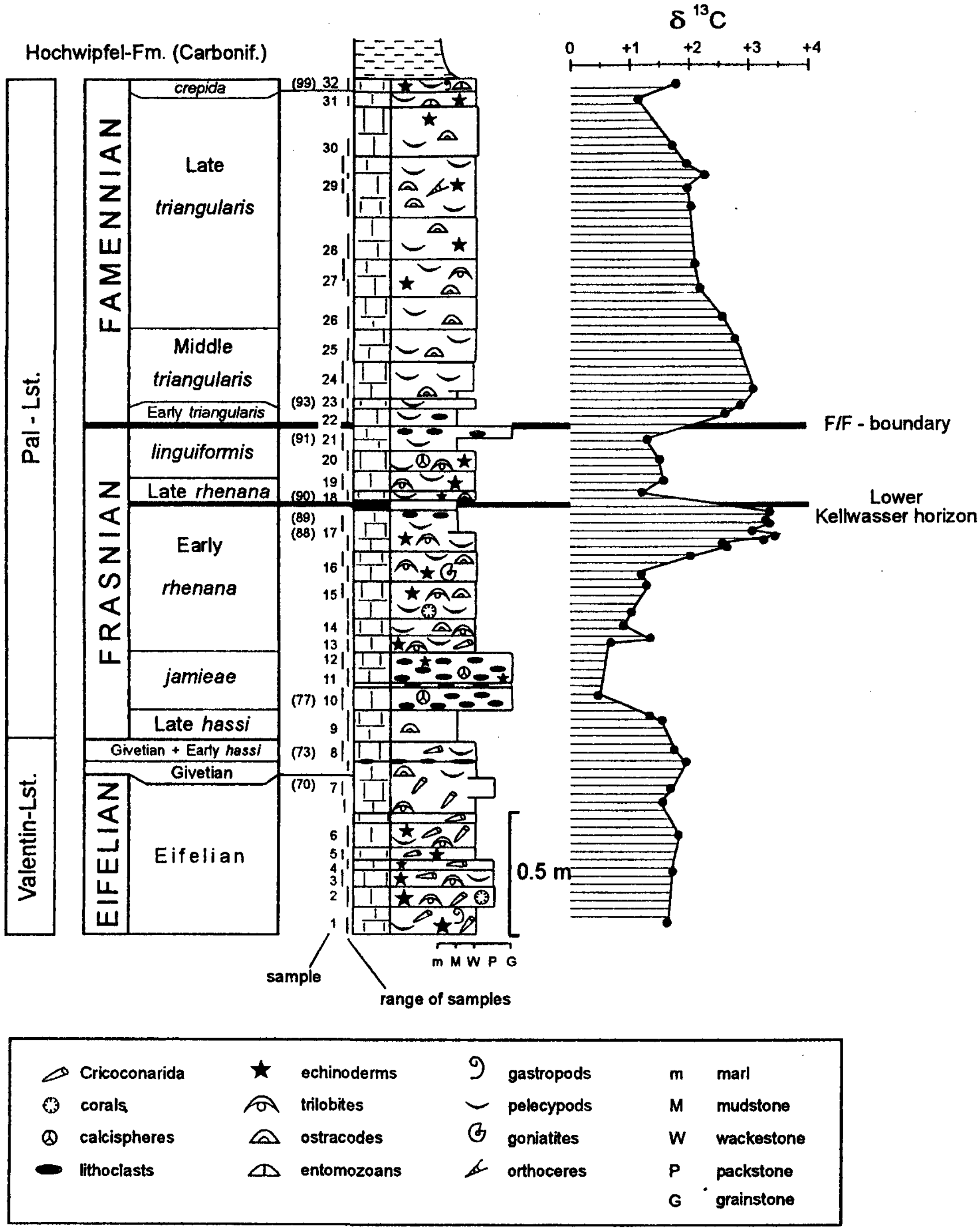


Fig. 20. Carbon isotope pattern across the Frasnian/Famennian boundary at the Wolayer Glacier section (modified from M. M. JOACHIMSKI, W. BUGGISCH & T. ANDERS 1994).

implications for the biosphere. More precisely, the well-known Frasnian/Famennian faunal crisis may have been caused by such perturbations.