

## Conodont-based event stratigraphy of the Early-Middle Frasnian transition on South Polish carbonate shelf

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Early to Middle Frasnian (E-MF) epicontinental sequences are investigated in five representative localities of the Holy Cross Mountains and Cracow region, with emphasis on conodont biostratigraphy, to evaluate the regional stratigraphic and biotic context of a major biogeochemical perturbation in global carbon cycling. Conodont associations from the *Palmatolepis transitans* to *Palmatolepis punctata* Zone boundary beds are dominated by the shallow-water polygnathid and ancyrodellid fauna in the South Polish epicontinental successions, and first appearances of index palmatolepid species are delayed due to facies control of pelagic environments during intermittent drowning of the carbonate shelf. Thus, identification of the zonal boundary is based mainly on species of *Ancyrodella*, and five distinctive ancyrodellid levels in the succession across the E-MF interval enable refined correlation of the sections studied, especially when paired with chemostratigraphic proxies. Prominent conodont biofacies shifts coincided with eustatic deepening, which is correlated with the Timan, Middlesex, and early Rhinestreet events, respectively. Trends in the conodont dynamics, mortality and diversity, partly replicated by the benthic biota (especially shelly faunas and crinoids), indicate that the faunal turnovers correlate also with the main  $\delta^{13}\text{C}$  excursions and related changes in trophic conditions. The E-MF transitional interval, marked by short-term sea-level fluctuations, is distinguished by a change from relatively diversified biofacies to more homogenous, mostly impoverished faunas. The latter change is a biotic response to the beginning of a prolonged (ca. 0.5 Ma) positive  $\delta^{13}\text{C}$  anomaly, probably paired with unsteady eutrophic and partly anoxic regimes. The late *Pa. punctata* Zone negative carbon isotope anomaly is synchronous with the second large-scale pelagic biofacies remodelling, including mesotaxid extinction. A stabilization of the carbon cycle and its return to normal background values at the start of the Early *Palmatolepis hassi* Zone coincide with conodont biofacies diversification and recovery of reef-related biofacies. With the exception of collapsed, endemic Kadzielnia-type mud-mound biota and a moderate biodiversity depletion due to overall ecosystem stagnation, no significant extinction events can be demonstrated, even if the large-scale changes in carbon cycling during the E-MF timespan are of higher-amplitude than the celebrated carbon isotopic anomalies related to the Frasnian-Famennian mass extinction. Thus, this regional succession in detail confirms that the large-scale *punctata* Isotopic Event (= *Pa. punctata* Event) is correlated neither with catastrophic environmental nor radical biotic changes.

**Key words:** Biostratigraphy, carbon isotopes, palaeoecology, benthos, pelagic biota, Devonian, Frasnian,

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