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Recent advances in the Ordovician stratigraphy of the Baltic Palaeobasin and Tornquist margin of Baltica

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ABSTRACT

Ordovician rocks are widely distributed in the Baltoscandian region as well as in Poland, Belarus, Ukraine and Moldova. The Ordovician studies in this area were initiated in the 19th century in the outcrop belt in northern Estonia. The strata are well accessible here and fossils and sedimentary structures are excellently preserved. Further south, in other countries, the succession is lying progressively deeper (up to 2500 m) in the subsurface, except for limited exposure in Ukraine. The thickness of the Ordovician within the Estonian outcrop area reaches about 100 m but exceeds 200 m in several parts of the subsurface area. Since the 1960s, several Ordovician correlation charts have been compiled for this area. Recent developments in the stratigraphy are summarised in the volume 'A Global Synthesis of the Ordovician System: Part 1' (*Geological Society, London, Special Publication*, 532).

The system of bio-, litho- and chronostratigraphic units is highly detailed in the area. The regional stages defined in Estonia were introduced for the western part of the East European Platform in the 1980s. The correlation of the regional succession to the global stratigraphic standard is generally well constrained, although it still needs to be refined in some details. A novel element of the stratigraphic standard, the isotopic zones, is based on secular variations of stable carbon isotopic composition of bulk carbonates and allows amendments to the correlation of strata.

The application of a regular timescale is based on a well-dated system of biostratigraphic marker levels that were traced into the Baltic Palaeobasin and further to the south. The dated boundaries were tied to the regional succession mainly based on the correlation of conodont, chitinozoan and graptolite zones, but also using chemostratigraphic events.

Correlation of formations to the chronostratigraphic standard in ten subregions (North and Central Estonia, South Estonia together with West Latvia and West Lithuania, Kaliningrad Region, East Latvia, Central Lithuania, East Lithuania together with northwestern Belarus, southwestern Belarus, West Volyn and Podillya together with East Volyn and Moldova) is summarised in an emended correlation chart. Development of the subregional correlation charts was well coordinated before the 1990s and the charts were based on a unified nomenclature of lithostratigraphic units for major facies zones that crossed the national borders. Trends in the development of nomenclature and correlation of formations have been different in different countries after 1991. This resulted in increasing differences in nomenclature and rank of lithostratigraphic units in subregions and led to an increase of the number of subregions. The development towards a more detailed stratigraphic classification in Lithuania has elevated the rank of many former units (several formations are now ranked as superformations, etc.). In 2011, a completely new system of formations and members replaced the formerly applied standard in the Kaliningrad Region.

The climatic history of the region presented in papers of the last decades is modified in the light of the newest results of isotope-geochemical studies on Baltoscandian sections, which do not support the idea of gradual warming throughout the Middle and Late Ordovician in the region. The global cooling trend was also influencing Baltica despite the continental drift towards the lower latitudes.

The richly fossiliferous regional succession has been extensively studied, but analyses with a broader view have been sparse. According to the general understanding, backed by data on different fossil groups, the main origination episodes in the early Darriwilian and Darriwilian–Sandbian transition led to the peak of regional diversity in the early Sandbian. Remarkable extinction events known from the early Darriwilian, early Sandbian and early Katian are expressed to a different degree in different fossil groups. The major extinction event in the latest Katian–Hirnantian, which impacted all major invertebrate groups, has been ascribed to the Hirnantian glaciation, the related glacioeustatic sea-level fall and the repeated rapid rearrangement of facies. A recovery that started in the latest Ordovician was relatively slow. Significant spatial differences in the dynamics of biodiversity within the eastern Baltic area and between this area and Scandinavia are considered partly due to uneven data coverage.

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