

Silurian stratigraphy in Estonia: Recent developments and challenges

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The Silurian of Estonia has been studied for nearly 200 years. Its main stratigraphic features were broadly but adequately summarised by Roderick Murchison in 1845, and the succession was further subdivided by Alexander Schrenk and Friedrich Schmidt in the 1850s. A detailed stratigraphic subdivision into regional stages was proposed by Hendrik Bekker a century ago, in 1925. The correlation between the Silurian succession in Estonia and the global chronostratigraphic standard established in the 1980s has been considered reliable for many decades. However, new information on the distribution of microfossils, combined with chemostratigraphic markers and K-bentonites, has changed our understanding of the Silurian stratigraphy in the region, inferring the need to update the regional scheme. In this study, we discuss the new data and correlation

possibilities. The most significant updates to the scheme are the following:

- (1) the lower part of the Juuru Regional Stage (RS) is of Hirnantian age;
- (2) the base of the Raikküla RS lies within the *Coronograptus cyphus* Graptolite Zone;
- (3) the Aeronian–Telychian boundary in Estonian succession correlates with a level in the middle of the Rumba Formation, indicating that the lowermost Adavere RS is of the latest Aeronian age;
- (4) the lower boundary of the Jaagarahu RS, as used up till now, is diachronous, and the best biostratigraphic approximation for the identification of this level is the FAD of conodont *Ozarkodina sagitta rhenana*;
- (5) the Wenlock–Ludlow boundary in the Estonian succession correlates with a level in the upper Rootsiküla RS;
- (6) the base of the Paadla RS corresponds to a level in the upper Gorstian, within the lower(?) *Phlebolepis ornata* Vertebrate Zone;
- (7) the Sauvere and Himmiste beds of the Paadla Formation correlate with the upper Gorstian, the Uduvere Beds of the same formation with an interval in the lower Ludfordian, with part of the *Ancoradella ploeckensis* Conodont Zone;
- (8) so far, there are no reliable criteria for recognising the Ludlow–Přidolí boundary in the Estonian succession.

It must be stressed that the proposed revised version of the regional Silurian stratigraphic scheme reflects the current understanding only, and there are still several challenges related to precise dating and correlation of strata, particularly considering the correlation of Estonian succession with the international standard and accurately identifying the global stage boundaries in the local sequence. Considering regional stratigraphy, one of the main problems that need to be addressed in future is the proper definition of the lower boundaries of the regional stages following the principles outlined in the International Stratigraphic Guide. So far, these boundaries are based primarily on lithological criteria being, in many cases, poorly constrained biostratigraphically and chemostratigraphically.

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