EGU21-13333
https://doi.org/10.5194/egusphere-egu21-13333
EGU General Assembly 2021


# The recovery of early vertebrates and reef ecosystems following the late Silurian carbon isotope excursion: the Burgen outlier, Gotland, Sweden

**Emilia Jarochowska**[1], Oskar Bremer[2], Alexandra Yiu[1], Tiiu Märss[3], Henning Blom[2], Thomas Mörs[4], and Vivi Vajda[4]

[1]Friedrich-Alexander-Universität Erlangen-Nürnberg, GeoZentrum Nordbayern, Department of Geography and Geosciences, Erlangen, Germany (emilia.jarochowska@fau.de)

[2]Uppsala University, Department of Organismal Biology, Norbyvägen 18A, SE-752 36, Uppsala, Sweden

[3]Department of Geology at Tallinn University of Technology, Ehitajate tee 5, 19086 Tallinn, Estonia

[4]Department of Palaeobiology, Swedish Museum of Natural History, P.O. Box 50007, SE-104 05, Stockholm, Sweden

The Ludfordian Carbon Isotope Excursion (LCIE) reached the highest known $\delta^{13}C$ values in the Phanerozoic. It was a global environmental perturbation manifested in a rapid regression attributed to glacial eustasy. Previous studies suggested that it has also heavily affected the diversity of conodonts, early vertebrates and reef ecosystems, but the timing of the crisis and recovery remained complicated owing to the lateral variability of $\delta^{13}C$ values in epeiric platforms and rapid facies shifts, which drove faunal distribution. One of the best records of this interval is available in the Swedish island of Gotland, which preserves tectonically undisturbed strata deposited in a Silurian tropical carbonate platform. We revisited the world-renowned collection of the late Lennart Jeppsson, hosted at the Swedish Museum of Natural History, Stockholm, which holds the key to reconstruct the dynamics of faunal immigration and diversification following the LCIE. Here we focus on the Burgen erosional outlier, which remained a mystery, as it had been correlated with the excursion strata, but preserved a high diversity of conodonts and reefal ecosystems. We re-examined key outcrops and characterized macro- and microfacies, as well as chemostratigraphy and unpublished fauna in the collection. Strata in the Burgen outlier represent back-shoal facies of the Burgsvik Oolite Member and correspond to the Ozarkodina snajdri Conodont Biozone. The shallow-marine position compared to the more continental setting of coeval strata in southern Gotland, is reflected in the higher $\delta^{13}C_{carb}$ values, reaching +9.2‰. The back-shoal succession in this outcrop includes reefs, which contain a large proportion of microbial carbonates and have therefore been previously compared with low-diversity buildups developed in a stressed ecosystem. However, the framework of these reefs is built by a diverse coral-stromatoporoid-bryozoan fauna, indicating that a high microbial contribution might be a characteristic of the local carbonate factory rather than a reflection of restricted conditions. In the case of conodonts, impoverishment following the LCIE might be a product of facies preferences, as the diverse environments in the outlier yielded at least 20 of the 21 species known from the Burgsvik Formation in Gotland. Fish diversity also returned to normal levels following the LCIE with an estimated minimum of 9 species. Thelodont scales appear to dominate samples from the

Burgen outlier, which is in line with previous reports. Our observations highlight how palaeoenvironmental reconstructions inform fossil niche and diversity analyses, but also how fossil museum collections continuously contribute new data on past biodiversity.