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Redox and biotic response to the early Silurian Ireviken Event, Welsh Basin, UK

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The Llandovery-Wenlock boundary interval in the early Silurian was a pivotal period marked by significant marine environmental evolution and biotic turnover, culminating in the Ireviken Extinction Event (IEE), which overlapped with the Early Sheinwoodian Carbon Isotope Excursion (ESCIE)[1]. The IEE coincided with a proposed expansion of euxinic waters along continental margins, according to geochemical evidence. The ensuing oceanic hypoxia caused a crisis in marine ecosystems; a typical and recurrent scenario during the Silurian Period. However, previous studies have focused on carbonate strata deposited in shallow water platforms[2], with a lack of crucial geochemical data for siliciclastic successions deposited across the continental shelf-slope. To address this gap, we applied multiple independent redox proxies to three sections deposited across a bathymetric transect in the Welsh basin, UK. Our findings suggest that oxic depositional conditions progressively gave way to anoxia, with the specific development of euxinia in mid-depth waters, just above the Llandovery-Wenlock boundary. However, in the shallowest water setting, an oscillating redox state between ferruginous-oxic or ferruginous-euxinic conditions is documented, with intervals of more persistent and intense bottom water anoxia exerting a particularly strong impact on the benthic biota. Our study highlights the importance of deeper marine sections for understanding the complex dynamics of the IEE and for providing crucial insight into the role of marine anoxia in shaping the evolution of marine ecosystems during the Silurian Period.

1 Calner, M. 2008. Silurian global events – at the tipping point of climate change. *Mass Extinction*. 21-57.

2 Young, S.A., Kleinberg, A. and Owens, J.D. 2019. Geochemical evidence for expansion of marine euxinia during an early Silurian (Llandovery–Wenlock boundary) mass extinction.