

Biological productivity and primary producers recorded in the depositional record from Middle to Late Devonian mudstones of the Horn River Group, Northwest Territories

M.T. LaGrange Rao^a, K. Li^a, L. Li^a, K.O. Konhauser^a, B.S. Harris^a, S.K. Biddle^a, and M.K. Gingras^a

^a *Earth and Atmospheric Sciences, University of Alberta, AB, Canada*

The Middle to Late Devonian was characterized by widespread black shale deposition and successive marine biotic crises attributed to expanded anoxia on marine shelves. The cause remains debated and requires constraints from associated marine conditions. This project aims to understand trends in primary producer type and biological productivity throughout Devonian anoxic pulses. We focus on the Horn River Group (HRG), an Eifelian to Frasnian organic-rich mudstone deposited along the western margin of Laurasia and presently located in the Northwest Territories, Canada. In our study area, this group includes two units: the Hare Indian Formation and the overlying Canol Formation. The dataset comprises whole-rock $\delta^{15}\text{N}$ ($\delta^{15}\text{N}_{\text{bulk}}$) and organic $\delta^{13}\text{C}$ ($\delta^{13}\text{C}_{\text{org}}$) collected from one continuous core. $\delta^{13}\text{C}_{\text{org}}$ values range from -30.4‰ to -28.2‰ and show a peak in the Hare Indian Formation with a second spike in the Canol Formation. $\delta^{15}\text{N}_{\text{bulk}}$ values are narrow in range (-3.7‰ to $+1.9\text{‰}$), without observable trends in the HRG. Nitrogen isotopic ratios near 0‰ are characteristic of N_2 -fixing (diazotrophic) primary producers and thus indicate that diazotrophs were dominant throughout deposition of the HRG, despite fluctuations in marine paleoredox. Trends in $\delta^{13}\text{C}_{\text{org}}$ throughout the Canol Formation indicate variations in biological productivity, suggesting that locally the growth rate of primary producers varied alongside changes in paleoredox. Our results can be compared to age-equivalent black shales to understand regional and global ecological patterns that contributed to widespread organic carbon burial.

Corresponding author: mayal@ualberta.ca