Eukaryotic paleoecology at the end of the Boring Billion: insights from Bylot Supergroup, Arctic Canada

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The current view of early eukaryote ecology assumes that (1) eukaryotes were restricted to nearshore environments where riverine nutrient input and oxygen availability from cyanobacterial mats created favorable habitats, and (2) prevalence of presumably inhospitable anoxic waters at the time limited distribution of eukaryotes.

To explore the nature of eukaryotic habitats during the Meso-Neoproterozoic transition, we studied a succession of siliciclastics and carbonates through the lower Bylot Supergroup (Baffin Island, Arctic Canada), dated at c. 1048 Ma (Re-Os). The Arctic Bay and overlying Iqqittuq formations record a transition on a NW-deepening ramp from a restricted basin to progradation of a carbonate-siliciclastic ramp in a marine-influenced basin. These trends allow comparison of eukaryote diversity and abundance in offshore and nearshore settings. Further, variations in water column redox recorded by iron speciation and trace metal enrichment analyses in Arctic Bay shales, allow us to test how diversity patterns are influenced by redox conditions. To reduce preservational bias, only samples with a high-potential for organic fossil preservation (TOC <0.5 wt%) were compared.

Well-preserved organic-walled microfossils were recovered throughout 900 m of strata from both units, including 22 taxa of unambiguous eukaryotes, several of which where formerly known only from late Tonian strata. The nearshore Iqqittuq Formation records the peak of eukaryotic diversity and abundance (21 species total, making up 56% of the assemblage species richness), consistent with the hypothesis that early eukaryotes preferred nearshore habitats. In contrast, within the deep-water Arctic Bay Formation, samples characterized by oxic bottom waters yielded mainly simple leiosphaerids (5 eukaryotic taxa), while samples that record anoxic bottom waters yielded more diverse eukaryotic microfossils (13 taxa), suggesting that the distribution of oxygen *per se* may not have controlled the distribution of eukaryotes.