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The preservation of pollen and spores across the Triassic–Jurassic transition in East Greenland

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During the Triassic–Jurassic transition (Tr-J; 200 Ma) the Earth's biota underwent a reorganisation that culminated in one of the 'Big-5' mass extinction events of the Phanerozoic. In East Greenland, plant macrofossils (mostly leaves) preserve a ∼17% genus-level extinction and an ∼85% decline plant species richness across the Tr-J. Sporomorph assemblages from this region do not provide evidence of such dramatic diversity loss: there is no statistically significant change in within-sample richness across the Tr-J in East Greenland, and just a 10–12% decline in among-sample diversity in the boundary interval. However, the extent to which reconstructions of Tr-J vegetation and estimates of plant diversity using sporomorphs are influenced by variations in the nature and quality of sporomorph preservation is currently unclear. In order to explore this issue, we have investigated the preservation of sporomorphs at a Tr-J boundary section at Astartekløft, East Greenland. We have analysed 18 samples spanning the Tr-J boundary from three depositional environments. Twelve samples are from overbank deposits, three samples are from a poorly developed coal swamp, and three samples are from an abandoned channel. From each of these samples, >55 randomly selected sporomorph specimens and (where present) >55 specimens of three spore genera Deltoidospora, Baculatisporites and Uvaesporites were assessed for the presence or absence of five damage types. These damage types were: thinning; corrosion; breakage; pinching; folding. Sporomorphs that were unaffected by any of these damage types were scored as "perfect". Our analyses indicate that the nature and quality of sporomorph preservation across the Tr-J at Astartekløft is extremely variable. The frequency of each damage type in randomly selected sporomorphs is not matched by the frequency of each damage type in the three spore genera that have been analysed. For example, corrosion is more frequent in Deltoidospora and Uvaesporites than in randomly selected sporomorphs, and folding is more frequent in Baculatisporites than in randomly selected sporomorphs. This variability hampers efforts to develop objective criteria to define reworked sporomorphs. There is no stratigraphic horizon, including the Tr-J boundary interval, characterised by an anomalously high or low frequency of sporomorph damage. However, the frequency of corrosion among randomly selected sporomorphs in the coal swamp was lower than in other depositional environments. Finally, we find no evidence of a relationship between the taxonomic richness of a sporomorph assemblage and the nature and quality of sporomorph preservation. This suggests that previously reported patterns of sporomorph diversity across the Tr-J in East Greenland are likely to be robust.