Estonian Journal of Earth Sciences
2023, **72**, 1, 164

https://doi.org/10.3176/earth.2023.03

www.eap.ee/earthsciences
Estonian Academy Publishers

Early land plant remains from the uppermost Ordovician–?lowermost Silurian Cedarberg Formation of South Africa

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The Cape Supergroup forms a regionally extensive and extremely thick Ordovician to Carboniferous succession of sedimentary rocks in southwestern South Africa. It includes the Lower–Middle Ordovician–lowermost Devonian Table Mountain Group, which incorporates the uppermost Ordovician Soom Shale Lagerstätte (within the Cedarberg Formation). The Soom Shale Lagerstätte accumulated in an unusual cold-water setting, associated with the decaying South African ice sheet, towards the end of the Hirnantian glaciation. The deposits of this glacial marine environment, characterised by anoxic bottom waters, preserve a highly unusual marine biota. It includes specimens exhibiting exceptional preservation of their soft tissues in clay minerals. Overlying deposits of the Soom Shale are shales and thin sandstones ascribed to the Disa Member that accumulated in a shoreface-shelf setting. Associated with these deposits are relict Soom taxa, in addition to a handful of *Clarkeia*-type brachiopod faunas, suggesting a probable earliest Silurian age for the upper part of the Cedarberg Formation.

Previous palynological investigations of the Soom Shale have yielded typical marine elements, including chitinozoans, scolecodonts and rare acritarchs, but also common terrestrial elements in the form of dispersed spore tetrads. The latter are historically important as they represent an early report, by Jane Gray and colleagues, of dispersed cryptospore tetrads and were the first evidence for early land plants from Africa south of the Sahara (Ordovician eastern Gondwana at 30° S).

Herein we report on a palynological investigation of an exposure of the Cedarberg Formation from the northernmost outcrops of the Cape Supergroup at Matjiesgoedkloof, Western Cape Province. Recently the sedimentology and ichnology of the underlying ice-marginal shallow-marine deposits of the Pakhuis Formation were described. Although macrofossils have not been recovered from these strata, they yield a fascinating ichnofauna that is diverse and disparate, comprising trackways and burrows. These show colonisation of glacial deposits by makers of burrows and trackways that lived in brackish water conditions as ice sheets retreated.

Our palynological investigation yielded assemblages of abundant and well-preserved palynomorphs. Although of moderate–high thermal maturity, they are much less coalified than palynomorphs from the more southerly exposures. Surprisingly, the assemblages are dominated by land plant spores with extremely rare, if any, marine palynomorphs. This may be a consequence of high freshwater influx from the decaying ice sheet's glaciers excluding normal marine biota (although the ichnological evidence demonstrates the presence of at least some organisms). The dispersed spore assemblage is somewhat unusual in that it is dominated by tetrads to the exclusion of monads and dyads. Coeval assemblages from similar palaeolatitudes in Gondwana (e.g. from the Arabian Plate) are far more diverse. This possibly reflects the close proximity of the vegetation to the ice sheet.

ABSTRACT

Received 28 March 2023
Accepted 3 April 2023
Available online 16 June 2023

Keywords:
Soom Shale, Hirnantian, Gondwana, glaciation, palynology, cryptospores

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Citation:
Wellman, C. H., Penn-Clarke, C. R. and Browning, C. 2023. Early land plant remains from the uppermost Ordovician–?lowermost Silurian Cedarberg Formation of South Africa. *Estonian Journal of Earth Sciences*, **72**(1), 164. https://doi.org/10.3176/earth.2023.03

14TH ISOS ESTONIA 2023