



# Notes on Lower Palaeozoic flysch trace fossils from Hall Land and Peary Land, North Greenland

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Seven ichnospecies are recorded from the Cambrian to Silurian turbidite succession of North Greenland. Two specimens are of particular importance as they provide new data on the palaeoenvironmental and stratigraphic range of their contained traces. *Protopaleodictyon* sp. is recorded for the first time from the Cambrian. The occurrence of *Rhizocorallium* sp. in deep basinal turbidites extends its occurrence in such environments back to the Ordovician and emphasises that caution must be exercised when utilizing the trace as an environmental indicator.

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Lower Palaeozoic flysch sequences in North Greenland were examined during 1979 with a view to identifying their contained ichnofauna. Due to the small number of available collections containing trace fossils, the lack of better-preserved and/or morphologically variable material and the unsatisfactory taxonomic status of many of the forms, the identifications have been restricted essentially to ichnogenic level. In spite of the restricted material, two of the specimens warrant additional comment, as they provide new data on the palaeoenvironmental and stratigraphic range (respectively) of their contained traces.

## **Ichnofauna, stratigraphy and location**

The following ichnofaunas, which were derived from the northern tip of Hall Land and the northern part of Peary Land (fig. 1), have been identified:

1) GGU collection 230278: *Helminthopsis* sp., *Gordia* sp., *Planolites* sp. From a variegated, thin-bedded, muddy turbidite wedge within the lower to middle part of the turbidite sequence constituting the Polkorridoren Group of north Peary Land (locality 1 on fig. 1). Cambrian age (Hurst & Surlyk, 1980; Surlyk *et al.*, 1980; Soper *et al.*, 1980).

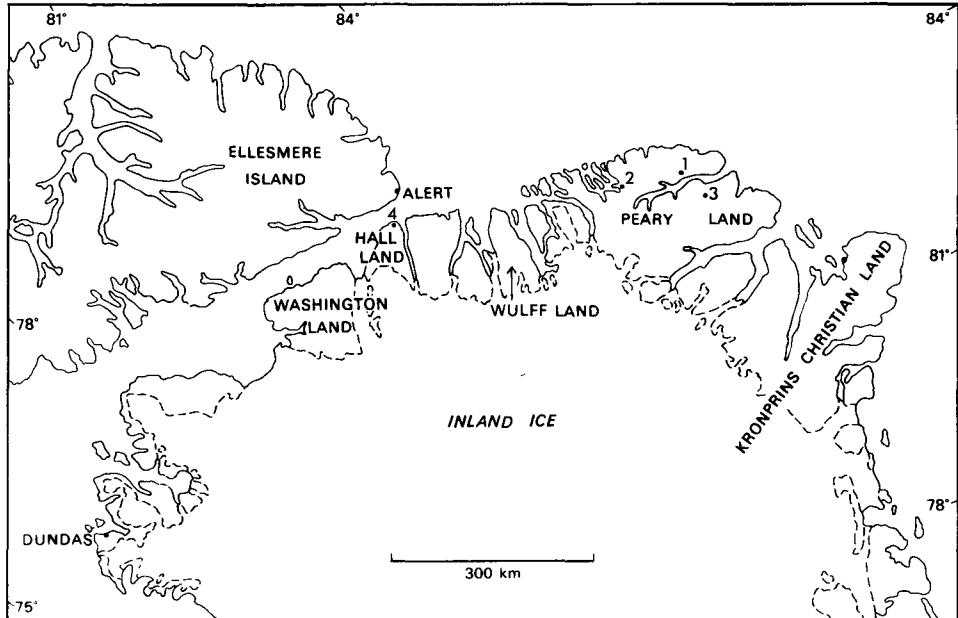


Fig. 1. Simplified geographical map of North Greenland showing the location of Hall Land and Peary Land. Locality numbers 1 to 4 referred to in text.

2) GGU collection 230279: *Helminthopsis* sp., *Gordia* sp., *Protopaleodictyon* sp., an unnamed horseshoe burrow. From the same unit as GGU collection 230278 (locality 1 on fig. 1).

3) GGU collection 230120: *Rhizocorallium* sp. From a sequence of thin-bedded silty turbidites, cherts and mudstones in north Peary Land, referred to by Dawes & Soper (1979) as formation B (locality 2 on fig. 1). Ordovician age (Surlyk *et al.*, 1980).

4) GGU collection 232306: *Planolites* sp. From the Silurian turbidites of Peary Land (locality 3 on fig. 1).

5) GGU collection 230195: *Cochlichnus anguineus*, Hitchcock, 1858, *Planolites* sp., an unnamed horseshoe burrow. From the Silurian turbidites of northern Hall Land (locality 4 on fig. 1).

6) GGU collection 230197: *Planolites* sp., *Scolicia* sp. From the Silurian turbidites of northern Hall Land (locality 4 on fig. 1).

### Ichnogenus *Rhizocorallium* Zenker, 1836

#### *Rhizocorallium* sp.

Fig. 2a, b

*Description.* A gently curved protrusive U-shaped burrow at least 120 mm in length and 25 mm in width. The burrow contains closely spaced and distinctive spreite, evident as a series of alternating ridges and grooves, and is parallel to bedding. The external tube-shaped

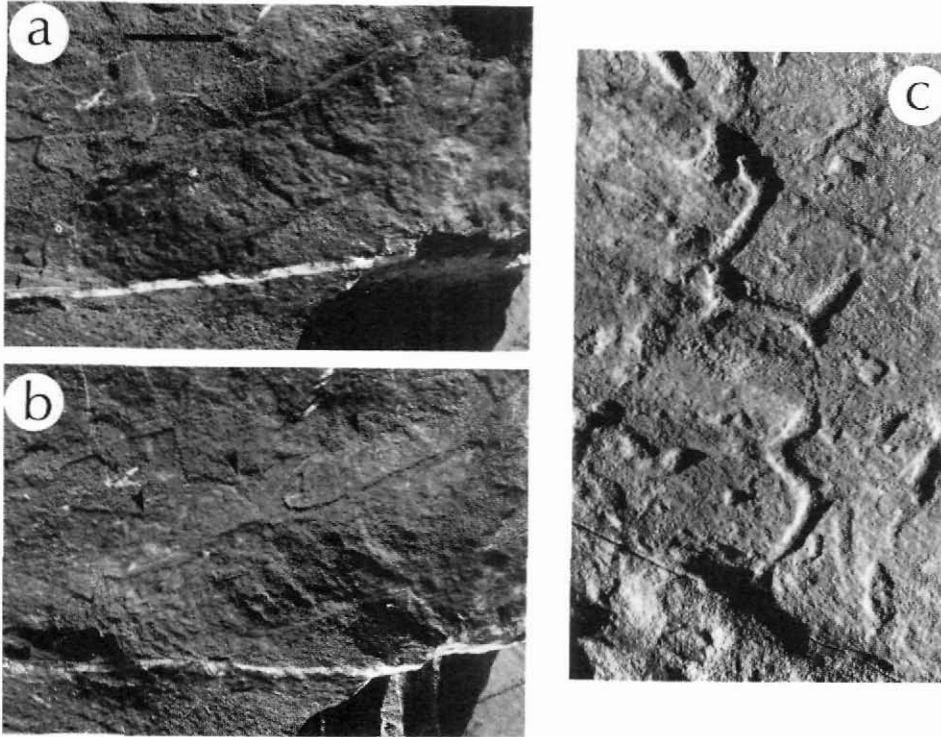


Fig. 2. a, b, *Rhizocorallium* sp. from the Ordovician turbidites of north Peary Land. a illustrates the spreite and b was taken using low angle light and illustrates the poorly preserved marginal tube, the edges of which are marked by arrowheads. Bar scale = 1 cm. MGUH 15.263 from GGU 230120. c, *Protopleodictyon* sp. from the Cambrian Polkorridoren Group turbidites of north Peary Land,  $\times 1.5$ . MGUH 15.264 from GGU 230279. Specimens are deposited in the type collection of the Geological Museum, Copenhagen.

burrow is poorly preserved but, where discernible, is 7 mm in width. The ratio of the width of the marginal tube to that of the spreite approximates to 1:3.5, which is close to the value given by Häntzschel (1960) as characteristic of *Rhizocorallium*.

*Discussion.* In view of the generally poor preservation, particularly of the marginal tubes, the specimen is only identified at ichnogenetic level. Nevertheless, the presence of these marginal tubes together with the given size dimensions distinguish the trace from the morphologically similar traces *Scolicia* spp., *Muensteria* spp. and *Zoophycos insignis*. The trace resembles *R. irregulare* Mayer, 1954, in that the burrow is horizontal, long and sinuous, but differs from it by having narrower tubes (see Fürsich, 1974).

*Rhizocorallium* has been recorded from neritic rocks of Cambrian-Tertiary age and is commonly regarded as being a characteristic shallow-water indicator (Chamberlain, 1978; Seilacher, 1978). Indeed, many authors have interpreted horizontal *Rhizocorallium* more specifically as shoreface indicators (see Basan & Scott, 1979). Little regard, however, has

been given to deep-water records in rocks particularly of Mesozoic and Tertiary age. Hayward (1976), for example, records *Rhizocorallium* in Miocene submarine canyon walls from New Zealand, Crimes (1977) in Eocene middle fan flysch sediments from northern Spain and Książkiewicz (1977) from both proximal and distal flysch in the Mesozoic of the Polish Carpathians. One of us (RKP) has also observed *Rhizocorallium* in delta front sediments and associated turbidites in the Carboniferous near Skipton, northern England. The example noted here now extends the known deep-water occurrences of *Rhizocorallium* back to the Ordovician. It seems likely, therefore, that the producing organism(s) (? crustaceans and/or annelids) was able to inhabit a variety of environments and that caution must be exercised when utilizing the trace as a specific palaeobathymetric indicator.

*Ichnogenus Protopaleodictyon* Książkiewicz, 1970  
*Protopaleodictyon* sp.

Fig. 2c

*Description.* The base of the specimen consists essentially of a network of intersecting *Helminthopsis* burrows. Where undisturbed, however, horizontal tunnel systems with a wide first order meander upon which is superimposed second order sine-shaped undulations with distinct appendages may be discerned. The burrow system consists of tiny threads, each 2 mm in width and smooth throughout their length. The graphoglyptid burrows are apparently uniramous but because of incomplete and poor preservation this observation remains tentative.

*Discussion.* The incompleteness and poor preservation of the specimens prevents ichnospecific identification. In addition, there is still no agreement as to which characters constitute a distinctive ichnospecies of *Protopaleodictyon*. Seilacher (1977) utilized the number of branches/undulations and Książkiewicz (1977) employed the regularity and spacing of the first order meanders and the size and thickness of the strings. Nevertheless, it is clear that the trace can be assigned to *Protopaleodictyon*, a distinctive flysch graphoglyptid trace fossil.

The ichnogenus has commonly been regarded as Carboniferous – Tertiary in age (Häntzschel, 1975), though more recently Pickerill (1980) has recorded it from Ordovician flysch strata in eastern Canada. Its occurrence in the turbidites of the Polkorridoren Group now extends its observed stratigraphic range well back into the Cambrian.

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