Climatic implications for modern continental traces from high latitude terrestrial environments: examples from Svalbard

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Abstract:

We report on the extraordinary occurrence of modern traces assignable to *Cochlichnus*, *Planolites*, and *Treptichnus* in a high polar latitude terrestrial setting near Svea, Svalbard. Svea is an old mining community that sits at 77°45'00"N, 16°43'50"E. The coldest average daily mean temperature is approximately –17°C from January to March. The warmest daily mean temperature ranges from 1–5°C from June to August. The remaining months experience daily mean temperatures below freezing. Average precipitation varies between 13 mm (May) to 29 mm (March), and comes in the form of snow, ice, fog, and/or rain. The traces were discovered on near-saturated, patchy grass-covered surfaces of a glacial outwash plain during an expedition in early June 2017. They were most visible in patches of sediment between grasses that were above the very high-water table; no traces were visible in pools of water between grass patches or in large areas underwater and/or barren of vegetation. Thin, regular sinusoidal trails < 1 mm in diameter attributed to *Cochlichnus* were most common. No tracemaker was visible producing these traces. Thin, curvilinear to irregular trails < 1 mm in diameter attributed to *Planolites* were common, but not as abundant as *Cochlichnus*. Thin, feather-stitch-like patterns < 1 mm in diameter attributed to *Treptichnus* were present, but less common than the other two morphotypes. Dipertan pupae were visible producing these traces. This trace association marks the highest known latitudinal occurrence of summer-produced invertebrate behaviors for an interstadial period, which can be used to interpret potential occurrences in deep time.

Keywords: *Cochlichnus*, *Treptichnus, Planolites,* polar, Svea