

Palaeoecology of the producers of trace fossil Phymatoderma from the Toarcian black shale in southern Germany

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There are a few black shale horizons which are characterized by the dense occurrence of the trace fossil Phymatoderma in the lower Toarcian Posidonia Shale in southern Germany. Phymatoderma is interpreted as a burrow system constructed by deposit feeders because of the presence of the fecal pellets. Because pellet fillings consist of a material different from the surrounding sediments, the detailed palaeoecology of the Phymatoderma producers is still vexing; whether fecal pellets are altered from the matrix by digestion (the work of substrate deposit feeders) or are imported from a food source at the sediment surface (the work of surface deposit feeders). In this study, carbon-isotope values and elemental compositions of filling materials, their surrounding black shale, and overlying mudstone are analyzed in order to identify the origin of the fillings of Phymatoderma and to clarify the detailed feeding strategy of producers. Carbon-isotope ratio of the filling materials showed little difference from that of the overlying mudstone, and instead had significantly heavier value than that of the ambient black shale. This fact means that the infillings of Phymatoderma were substantially derived from their overlying mudstone as a result of surface sediment feeding by their producers. Then, comparison between elemental compositional values of the fillings and those of the overlying mudstone showed no significant difference. This fact strongly suggests that the Phymatoderma producers non-selectively ingested surface sediments.