ICHNOECOENOSIS OF A PALEOCENE SUBMARINE-CANYON FLOOR, POINT LOBOS, CALIFORNIA

by Gary W. Hill

U. S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94025

INTRODUCTION

In this part of the field guide, I describe a trace fossil-assemblage (ichnocoenoses) of a Paleocene submarine canyon floor and interpret the depositional environment as indicated by the traces and associated lithologic evidence (described and interpreted by Ed Clifton, this volume). An evaluation is also made of the paleoenvironmental significance of the ichnofossils relative to ichnoassembly diversity, bioturbation patterns, and paleobathymetric interpretations.

"Trace fossils are the behavioral responses of animals to their environment preserved in rocks" (Chaplin, 1980); i.e., fossil tracks, trails, burrows, and borings. Because behavior is subject to convergent evolution as dictated by specific life modes and environmental requirements (Elders, 1975), trace fossil assemblages tend to recur through time and space as critical environmental conditions occur (Frey, 1975). Consequently, ichnoassemblages are gaining use as paleoenvironmental indicators.

Trace-fossil assemblages have been used commonly as paleobathymetric indicators because many of the environmental variables controlling the distribution of organisms (trace-makers) tend to change progressively with water depth. For example, a gradational change from vertical to patterned horizontal burrows from shallow to deep water corresponds to a change from suspension feeding to deposit feeding which is a response to food distribution (Seilacher, 1967). A bathymetric zonation of trace fossils was established by Seilacher (1964, 1967), each zone named for a predominant ichnogenus: shallow water (above wave base), Cruziana, Skolithos, and Glossifungites; intermediate shelf (below wave base), Zoophycus; bathyal-abyssal, Nereites.

Two types of trace fossil classification are used in this report: preservational and ethological. The preservational classification scheme (Fig.1) is drawn from Martinsson (1970). Seilacher's (1953) ethological classification of bioturbation structures includes five categories; resting traces (Cubichnia), crawling traces (Repichnia), grazing traces (Pascichnia), feeding structures (Fodinichnia), and dwelling structures (Domichnia). To this list, escape structures (Fugichnia) are now commonly added as a sixth category (e.g., Simpson, 1972).

The description of the study location, geologic setting, and various lithofacies by Ed Clifton (this volume) will not be repeated here. Clifton's interpretation of submarine-canyon subenvironments (channel, levee, and interchannel) are adopted in the discussion of trace-fossil distribution at Point Lobos.

PREVIOUS WORK

There has been very little previous work on the trace fossils in the Carmelo Formation of Bowen (1965) at Point Lobos. Herold (1934) and Nili-Esfahani (1965) describe some of the trace fossils, but they mainly focus on seaweed casts.

Hayward (1976) described trace fossils from an early Miocene submarine canyon in New Zealand. In his study, the only other published study of a submarine canyon ichnocoenosis that I am aware of, only three identified ichnogenera are listed - Tigliolites, Scalarituba, and "branching" Planolites.

Figure 1. Diagrammatic representation of a toponomic terminology based on the casting medium (coarser sediment) of preservation. (From Martinsson, 1970).

TRACE FOSSILS

To date (the work is still in progress), the ichnocoenosis of the Carmelo Formation includes (1) the ichnogenera Planolites (2 species), Chondrites, Arenicolites, Ophiomorpha, Thalassinoides, Scolicia, Neonereites, Taurichnites, Helminthoida, (2) escape structures, and (3) two unidentified traces.

ichnogenus Planolites Nicholson 1873

Planolites sp. A

(Fig. 2)

Description. Simple, unbranched, unornamented, straight to irregularly curving, cylindrical or subcylindrical, sediment-filled endichnial burrows which are 5-10 mm in diameter. Traces have been measured to bedding-plane lengths of 50 cm. These full relief traces are dominantly horizontal or subhorizontal to bedding planes. Concentration of this trace varies from isolate to dense within a single bed (if present at all). In the latter case, the traces commonly overlap which results in apparent branching. The smooth unlined walls of the trace are distinctive due to a slight concentration (relative to the country rock) of dark minerals whereas the sediment filling the trace is of the same texture and color (in places slightly darker) as the country rock.

Upper Cretaceous and Paleocene Turbidites, Central California Coast, 1981
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