

To: Nicholas B. Harris

Date: September 14, 1983

From: Robert W. Frey *Rwf*

Phone: 404-542-2652

Subject: Evaluation of Trace Fossils in Cores, Based on Color Slides

The following is my report on the eleven color slides you sent. I compared each slide lithologically with your log, but did not attempt to use your log in establishing my own concept of the facies succession. Rather, I tried to evaluate each slide in terms of its individual, local significance. Then I tried to determine whether I could detect a trend or common denominator among these individual, local occurrences. As indicated below, the more diagnostic slides seem to me to represent some sort of haline estuarine environment, e.g., compare your logs and slides to the publication by Howard and Frey (1975), cited below.

I stress, however, that the examination of slides alone can be misleading (e.g., what I might perceive as a distinct structure might be known to you as an artifact of the saw, etc.). So, by all means, use the full force of all data available to you in making your final interpretations.

Significance of the Slides

- 3663--general bioturbate texture, ?graded cross-sets. Seen in modern Georgia estuaries (Howard and Frey, 1975, Plate 3).
- 3665--vague bioturbate texture. Nondiagnostic.
- 3672--Skolithos, ?graded cross-sets. Compare with dwelling tube of polychaete Onuphis in modern Georgia estuaries (Howard and Frey, 1975, Plate 4).
- 3673--Skolithos, other smaller polychaete-type burrows. See above comment on 3672. Compare smaller burrows with those of Heteromastus in modern Georgia estuaries (Howard and Frey, 1975, Plates 5, 11).
- 3674--vague bioturbate texture. Nondiagnostic.
- 3676--vague ?traces. Nondiagnostic.
- 3682.0--general bioturbate texture, small burrows (as in 3673), ?flasers. Seen in modern Georgia estuaries (Howard and Frey, 1975).
- 3682.2--general bioturbate texture, Palaeophycus (= thickly lined tube). Seen in modern Georgia estuaries (Howard and Frey, 1975).
- 3682.8--lower two-thirds somewhat like 3682.2.
- 3683--general bioturbate texture, more or less like 3682.2.
- 3704--possible escape structure, suggesting rapid deposition or migrating avalanche faces. Compare with Howard and Frey (1975, Plate 12).

On the whole, biogenic sedimentary structures visible in the slides are considerably less diagnostic and diverse than I would have wished. None of

these structures is exclusively restricted to any single depositional regime. As indicated in the above comparisons, however, such features are common at places in modern Georgia estuaries.

Conclusions

I see no biogenic evidence for a normal marine environment. Skolithos, Palaeophycus, and various bioturbate textures do indeed occur in normal marine facies, but in combination with various other kinds of trace fossils and bioturbate textures not apparent in your slides. Your occurrences indicate some sort of restricted environment from an organism's viewpoint.

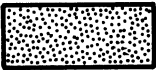
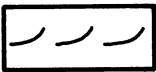


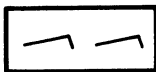
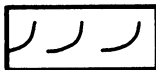
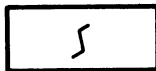
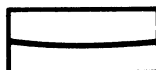
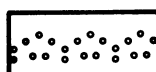
Similarly, at least in the more definitive slides (such as 3663, 3672, 3673, 3682-3683), I see no compelling evidence for a purely freshwater environment. Simple Skolithos tubes can occur in nonmarine environments; but, in my experience, all lack thick, distinct walls such as those in 3672. The more bioturbated intervals also suggest at least some saline influence.

Thus, somewhat by choice-of-elimination, I suggest a brackish estuarine setting for ichnofossiliferous parts of your core. However, the lack of trace fossils and bioturbate textures through most intervals of your core logs may indicate a basic fluviatile system reached only intermittently by estuarine influences. That also would explain the low diversity of trace fossils present as well as the paucity of mud and silt in your core logs, and it also fits the Georgia analog in terms of rivers such as the Satilla, Altamaha, and Ogeechee (Howard and Frey, 1975).

Reference Cited

Howard, J. D. and R. W. Frey. 1975. Estuaries of the Georgia coast, U.S.A.: sedimentology and biology. II. Regional animal-sediment characteristics of Georgia estuaries. *Senckenbergiana Maritima*, 7:33-103.

Key to Sedimentary Structures (To Accompany Plate 1)

- | | | |
|---|---|---|
| 1 |  | Massive |
| 2 |  | Low Angle Tangential Cross-Bedding |
| 3 |  | Horizontal Bedding |
| 4 |  | Planar Tabular Cross-Bedding |
| 5 |  | Ripple Cross-Laminations |
| 6 |  | Steep (Angle of Repose) Tangential Cross-Beds |
| 7 |  | Burrows |
| 8 |  | Erosional Truncation |
| 9 |  | Sandy Conglomerate |

Facies A is Characterized by Dominance of Sedimentary Structures 1-4. Facies B is Characterized by all Types of Structures Listed Above. (See Text for Details).

Plate 2