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Molluscan Shell Transport—You Ain't Seen Nothin' Yet

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In the inaugural issue of PALAIOS, we learned from Henderson and Frey (1986) that mollusk shells from the Southeastern United States inner continental shelf can be transported onshore into adjacent estuarine environments. This demonstrates simultaneously (1) that estuarine sediments may be derived at least in part from offshore, and (2) that the fossil record generated from such environments may be confusing if not downright misleading.

But the readers of PALAIOS "ain't seen nothin' yet." A few years ago, while working off the Southeastern U.S. margin, we (Elmore et al., 1979) documented some striking examples of shallow water molluscan shell transport in a seaward direction. In fact, in the case of one giant turbidity current "event" of 16,000 years B.P., shells from the shallow subtidal zone were displaced more than 500 km offshore as the crow flies (and longer as goes the meandering Hatteras Submarine Canyon), to water depths in excess of 5,000 m. This event produced a large turbidite called the Black Shell turbidite (Elmore et al., 1979), which extends across the Hatteras Abyssal Plain for at least 500 km and has a volume well in excess of 100 km^3.

Figure 1 shows the general outline of the Black Shell turbidite on the Hatteras Abyssal Plain, with respect to the western North Atlantic Ocean Basin and the Southeastern U.S. Continental Margin. The turbidite probably extends across a much larger area than that shown in Figure 1, but further piston-core correlation to the south was impossible. Correlation was based on sand layer components, and where the sand ran out, our mapping ended.

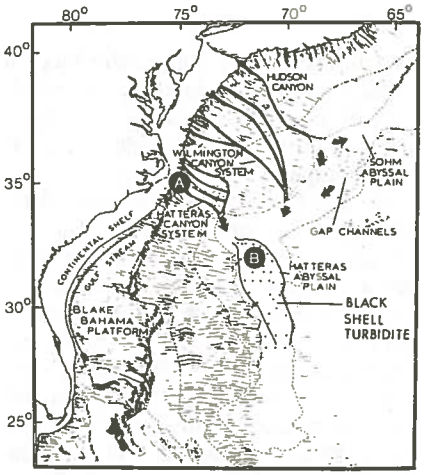

FIGURE 1—The Black Shell turbidite of the Hatteras Abyssal Plain. The shallow water molluscan shells shown in Figure 2 travelled from point A to point B as the result of a giant slump that occurred at the shelf edge at approximately 16,000 years B.P. Figure is modified after Elmore et al. (1979).

The shell material shown in Figure 2 is representative of the basal portions of the turbidite near the mouth of the Hatteras Canyon, where the flow disgorged onto the plain. These shells were collected at point B in Figure 1 and probably originated at point A. The "Black Shell Event" must have begun when a massive slump occurred at the shelf edge off what is now Cape Hatteras, North Carolina, at a time of lowered sea level when the shoreline also was near the shelf edge.

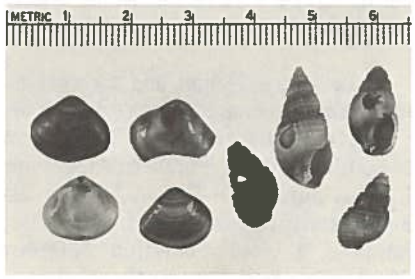

FIGURE 2—The two most common molluscan shells from the Black Shell turbidite of the Hatteras Abyssal Plain are: left, *Mulinia lateralis* (Say), and right, *Nassarius trivittatus* Say. These species are endemic today to estuarine and shallow continental shelf environments.

Evidence for the shallow origin of this coarse material is as striking as its distance of travel. Besides the fact that virtually all of the shells are estuarine to shallow continental shelf species (Elmore et al., 1979, Table 3), many shell fragments are very well rounded, indicating original deposition on a high energy beach system such as exists today along the North Carolina Outer Banks. Most of the shells are stained black, indicating burial in nearshore muds (Pilkey et al., 1969). Others of the well-rounded shell fragments are stained brown, a limonite-staining phenomenon that we believe occurs on beaches (Pilkey et al., 1969).

A comparison of the onshore displacement of shells documented by Henderson and Frey (1986) and the offshore phenomenon observed by Elmore et al. (1979) is as follows: Onshore displacement distance is probably less than 10 km, versus at least 500 km offshore displacement. The 10-km-wide band where landward transport takes place may well extend along the entire Mid-Atlantic and Southeastern U.S. coast. The Black Shell turbidite is a spot phenomenon involving large volumes of material obtained from a small area. Onshore transportation takes place mostly at depths of less than 20 m, whereas the Black Shell turbidity current moved material through a 5,000 m depth range. Last but not least, the Black Shell turbidity current devoured a bite out of the continental margin large enough to have encompassed a cross section of the entire nearshore system within which the aforementioned onshore displacement takes place!

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