

RECENT RESULTS FROM AN ONGOING STUDY OF THE
SEDIMENTOLOGICAL AND PALEONTOLOGICAL CHARACTERISTICS OF
THE UPPER CRETACEOUS NAVESINK FORMATION, CENTRAL NEW
JERSEY COASTAL PLAIN

J Bret Bennington and Robert Vincenti
Hofstra University

Department of Geology, 114 Hofstra University
Hempstead, New York 11550-1090
Email GeoJBB@Hofstra.Edu

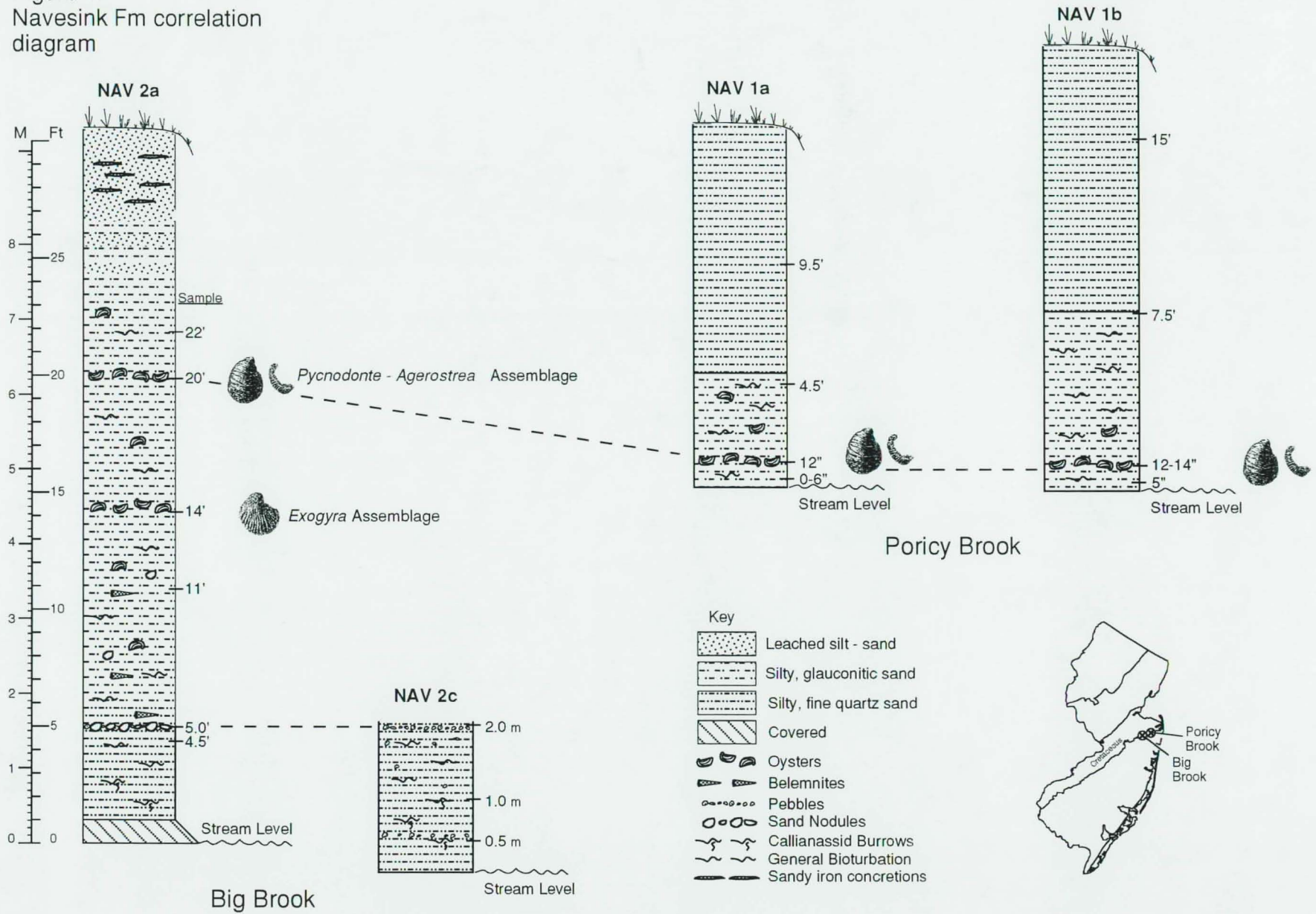
Abstract

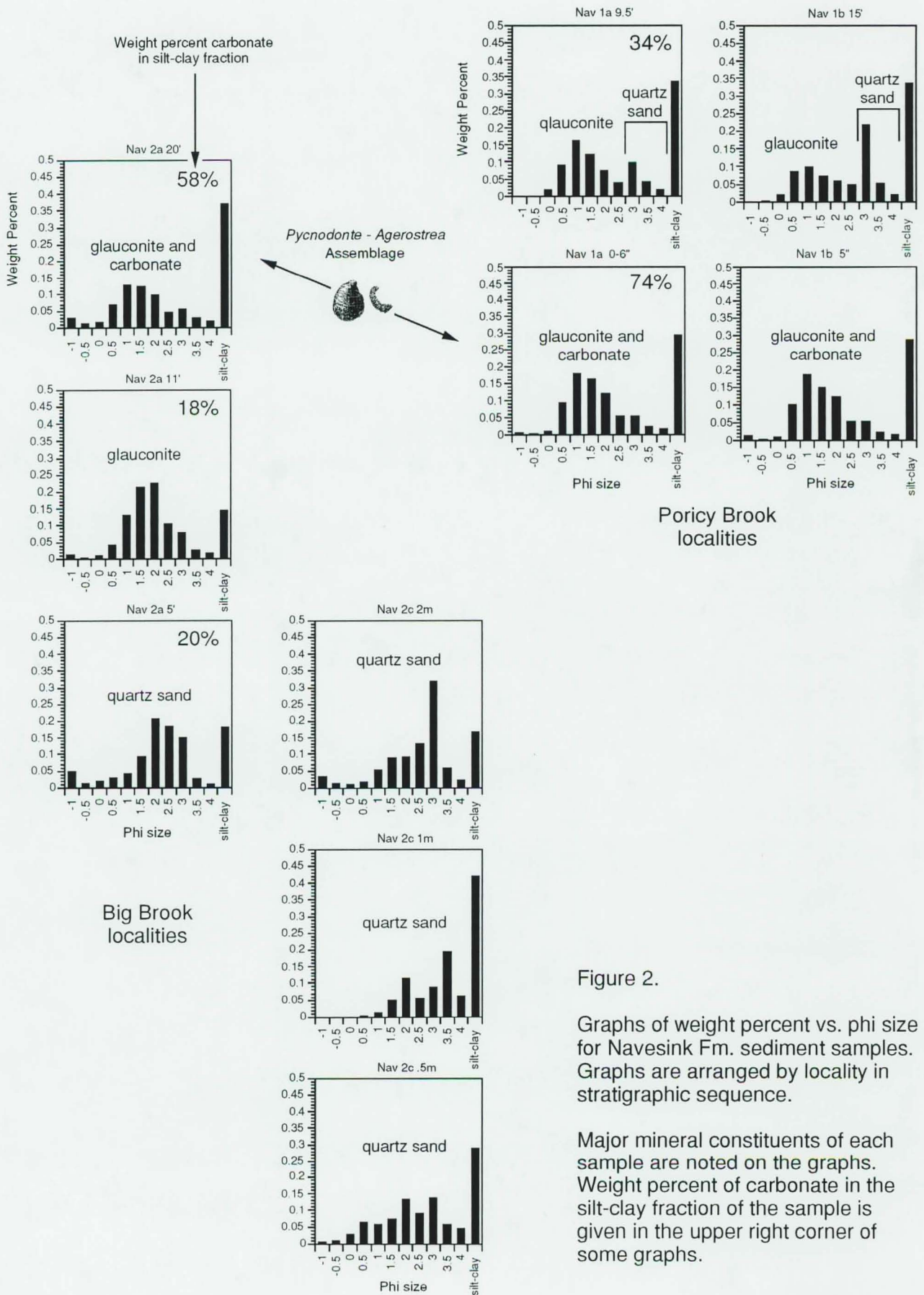
In Monmouth County, New Jersey the Upper Cretaceous Navesink Formation is well-exposed along the banks of Big Brook at the Boundary Road Bridge and along the banks of Poricy Brook, at Poricy Park on Middletown-Linecroft Road. Correlation between these two localities of a shell bed with a distinctive assemblage dominated by the oysters *Pycnodonte* and *Agerostrea* shows that only the upper section of the Navesink is exposed at Poricy Brook, including the base of the transition into the overlying Sandy Hook Member of the Red Bank Formation. This correlation is strengthened by similarities in the sediment characteristics between the two localities. The more complete stratigraphic section at Big Brook exhibits three distinct facies within the Navesink Formation: 1) a thin basal pebble lag (app. 30 cm) overlain by 2) pebbly quartz sands with abundant callianassid burrows (app. 2.5 m), followed upsection by 3) bioturbated glauconitic sands (app. 7 m) bearing two distinct shell beds with dissimilar macrofossil assemblages (Fig. 1). Upstream exposures along Big Brook show the upper interval of the Mt. Laurel Formation below the base of the Navesink Formation to consist of a sparsely fossiliferous, burrowed, thin-bedded sand and mud lithofacies. No upper shoreface or beach deposits are preserved between the Mt. Laurel and Navesink Formations.

A variety of interpretations have been advanced for the facies associated with the Navesink Formation. Martino and Curran (1990) interpret the upper Mt. Laurel below the Navesink contact to have been deposited as tempestites in the transition zone between the offshore and shoreface regions of the inner shelf. Owens and Sohl (1969) suggest that these sediments are distal deposits of a subaqueous delta plain. The contact of the Mt. Laurel Formation with the Navesink Formation is agreed by most authors to be an erosional contact. Martino and Curran (1990) note the absence of shoreface deposits in the upper Mt. Laurel and argue that the base of the Navesink Formation represents a ravinement surface, developed following lowstand exposure of the shelf and erosion of the Upper Mt. Laurel deposits. Becker et al. (1996) demonstrate the presence of a reworked and temporally mixed fossil assemblage at the base of the Navesink, arguing for significant remobilization of sediments associated with shoreface retreat during the Navesink transgression.

Overlying the basal transgressive lag (which we have not yet sampled) is an interval of bioturbated, pebbly quartz sand with abundant carbonaceous matter and some glauconite. This interval is extensively burrowed, with the distinctive trace fossil *Ophiomorpha* present in abundance in the lower half of the interval. *Ophiomorpha* has not previously been reported from the lower Navesink. It is not uncommon to find the claws of the callianassid crustacean *Callianassa mortoni*, preserved within the *Ophiomorpha* burrows at the Big Brook locality. Also present within this interval are common shark teeth. Martino and Curran (1990) note a concentration of pebbles, belemnites, and shark

Figure 1.
Navesink Fm correlation
diagram





teeth at the contact with the overlying glauconite sand interval and infer a decrease in depositional rate upsection culminating with a diastem at the contact. We note the presence of several pebbly horizons within the lower sandy interval of the Navesink, suggesting the presence of several diastems within this interval. Martino and Curran (1990) interpret the lower sandy interval as a transgressive sheet sand deposited during shoreface retreat. The presence of abundant callianassid burrows supports a lower foreshore to shallow subtidal environment of deposition (Martino and Curran, 1990), although the upper part of the interval, with its pebbly horizons and abundant carbonaceous matter, may record the transition to a more offshore, inner shelf environment (Owens and Sohl, 1969).

The transition upsection from quartz sand to predominantly glauconite sand is abrupt, occurring at a pebbly horizon with abundant belemnites and irregular, sand-filled burrows (possibly *Rosselia*). Above this horizon there is little lithological change in the Navesink until the reappearance of fine quartz sand at the transition into the Red Bank Formation. Sediments from this interval are predominantly sand-sized glauconite, silt, and clay (Fig. 2). Two shelly horizons are found within this interval at Big Brook, a lower horizon dominated by an assemblage consisting of pectens and the oyster *Exogyra* and an upper horizon dominated by the oysters *Pycnodonte* and *Agerostrea*, and the brachiopod *Choristothyris*. At both of these horizons microfauna are abundant and diverse. At Poricy Brook only the upper shelly horizon is exposed. The genesis of the shelly horizons is not well understood. It is generally inferred that glauconitic sands form on the outer shelf during periods of slow detrital input (Owens and Sohl, 1969). If this is the case, then why are shelly macrofossils not abundant throughout the Navesink? There is some indication that the shelly horizons represent extended intervals of time during which shelly material accumulated but glauconite did not. Many of the shells, particularly in the upper horizon at Big Brook, are extensively bored by *Cliona*, indicating their prolonged exposure on the seafloor. Also, the amount of silt- and clay- sized material is much greater at the shelly horizons than in the sparsely fossiliferous glauconitic sands (Fig. 2). Much of this fine material appears to be planktonic foraminifera tests as indicated by the large fraction of carbonate in the fine sediment fraction and corroborated by microscopic observation of dense quantities of foraminifera at larger phi sizes in the samples. It appears that planktonic foraminifera were able to accumulate without dilution by glauconite formation, perhaps due to episodic changes in the benthic environment during deposition of the Navesink that inhibited production of glauconite, allowing fossil material to accumulate.

The initial transition to the overlying Sandy Hook Member of the Red Bank Formation is shown at the Poricy Creek locality by the reappearance of fine quartz sand as a dominant component of the samples, mixed with the glauconite. The Sandy Hook Member has been interpreted to be a prodelta facies developed as fluvial systems built out from the shoreline following the end of the Navesink transgression (Owens and Gohn, 1985).

References

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