Holocene Reefs and the Evolution of the Peconic 'Oyster Terrain'.

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Holocene oyster deposits are ubiquitous along the U.S. Eastern Atlantic seaboard, but intact relict oyster reef morphologies that we believe we have unveiled in the Peconic Estuary 'Oyster Terrain' are less common. Early to Mid-Holocene transgressive deposits, oyster reefs in particular, are typically reworked on the open high energy shelf. In some places transgressive deposits have been buried under enough sediment to preserve features, but they are buried to an extent that makes it difficult to access them for study. As reported previously, multibeam mapping of the Peconic Estuary as part of a benthic habitat mapping project has revealed a relict oyster terrain in Flood et al. (2006), Kinney & Flood (2007a,b), and Kinney & Flood, (2008). High backscatter mound morphologies topped by oysters are interpreted to be relict oyster reefs. Thousands of mounds are exposed at the surface of the seafloor with even more buried under just a few meters. This terrain covers hundreds of square kilometers within the estuary. We believe these oysters to be thousands of years old with growth initiating in the early Holocene. Here we will describe the Peconic Oyster Terrain morphology to compare it with what is known of other oyster reefs. In particular, examples of living reef morphologies of Crassostrea virginica, the species found in the Peconic Estuary and along the East Coast of the U.S., will be shown. Examples of relict oyster reefs will be compared as well.

Comparison of studies describing active oyster reefs of Crassostrea virginica to the relict reefs in the Peconic Estuary is important to understanding these deposits. A striking example of a live oyster reef is in Altamaha Sound, GA where almost 2 m of oyster reef was reported to be exposed vertically above the sea surface at low tide in 1925 (Galsoff, 1964). Some active and long lived oyster reefs a few meters thick can also be found offshore, such as off of Florida where enough freshwater discharge maintains brackish seawater near the coast near the Suwannee River (Wright et al, 2005). Further offshore relict oyster reefs that form chains several kilometers long can also be found near the Suwannee River (Wright et al, 2005).

Known examples of relict Holocene oyster deposits range from reworked shells scattered across the continental shelf, as described by Merrill et al. (1965), to intact mounds in modern estuaries, to a range of oyster deposits including both reworked layers and relatively intact deposits with articulated valves that have been found in the Gulf of Mexico (Rodriguez et al., 2004).

Studies of oyster reef morphology from outside of the Peconic Estuary using similar techniques (i.e. multibeam, sidescan sonar or seismic profiles) are of particular interest to compare with our data for the Peconic Estuary. An example of sidescan data showing numerous oyster reefs in Louisiana can be found in Allen et al., (2005), which shows similarly shaped mounds. A well-described example of relict oyster reef morphology in the James River Estuary in Virginia includes seismic profiles in

DeAlteris, (1988). Multibeam data from Clapp & Flood, (2004) show relict oyster reefs in the shallow lagoonal waters of Great South Bay, Long Island, which look flatter than reefs found within the Peconic Estuary. Images of sidescan data for relict oyster beds in the Hudson River (Slagle et al., 2006, and Carbotte et al., 2004) do not have the distinctive round mound shape found in the Peconic Estuary either.

In order to examine more examples of extensive deposits that are a few meters thick, the morphology of relict oyster reef deposits of species other than Crassostrea virginica need to be compared. Massive relict oyster beds have long been known on land, outcrops of Eocene oyster beds in Georgia are as thick as 7 m (Veatch and Stepheson, 1911; Wiedmann, 1972), and Pliocene deposits in Murray Basin, South Australia have oyster reef features that are a few meters high and tens of meters across, spread over a large estuary (Pufahl et al., 2004).

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