

Understanding the Occurrence of Point-Bar Deposits *versus* Vertically Accreted Channel-Fills

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Summary

Inclined Heterolithic Stratification, or IHS, was introduced in the late 1980's to link descriptions related to the internal architecture of different subtidal deposits (Thomas et al., 1989). IHS has been observed in many depositional environments, from rivers, to shelf turbidites. It has garnered the most use when describing deposits from tidally influenced rivers and in estuary settings. This has led to a strong association of IHS deposits to point-bar settings. In mud-dominated tidal settings, however, IHS is commonly preserved within vertically aggraded, non-abandonment phase channel fills.

Tidal point-bars and aggraded channel-fills represent subtidal deposits that can form in the middle to inner portions of estuaries. The primary difference between the two types of estuarine deposits is in the manner that the IHS is deposited. Point-bars form along the inside bank of a channel as it cuts laterally across topography. Deposition occurs opposite the locus of incision (the cutbank), producing lateral accretion deposits along one side of the channel, which internally fine up-river. Point-bars vary morphologically depending on the curvature of the meander, and are restricted in their size to by the size of the channel they are being deposited in. Channel-fills, on the other hand, form irrespective of their location in a channel, and are deposited across the width of the channel, producing vertical accretion deposits. The main difference between the two lies in their internal architecture: point-bars are comprised solely of IHS, while channel-fills comprise the continuum of IHS-HS-IHS. This added component of heterolithic strata contributes to a much different internal stacking pattern, creating a distinct geobody quite different from that of a point-bar. The distribution of hydraulic energy across the geobody also plays into the morphology of the geobody. Point-bars have hydraulic energy focused along the thalweg, with energy decreasing up-bar, while channel-fills have the hydraulic energy more broadly distributed across the channel. These differences are related to the effect of the regular rise and fall of the tides, and a lack of fluvial influence. Lastly, the sedimentary inputs affect the type of deposit – point-bars have a higher affinity to sand-dominated settings, while channel-fills are more commonly found in mud-dominated settings. This could be related to the geographic location (i.e. sedimentological composition of the drainage catchment), as well as location within an estuary (i.e. outer estuary sandier than inner estuary). All of these factors lead to different grain-size and ichnological distributions both vertically and laterally, and can be used to characterize between point-bars and channel-fills.

Using examples from the Palix River (Willapa Bay, Washington) and the Little Ogeechee River (Ossabaw Sound, Georgia) (Figure 1), point-bars and channel-fills from similar locations in the estuary continuum are contrasted in terms of their sedimentological, ichnological, and geometrical makeup (Figure 2, 3, 4). Both the Palix and Little Ogeechee have a mesotidal range, a similar coarse marine and fine fluvial grain-size input, and both are characterized as tidal channels (have minimal to no fluvial input), which suggests that point-bars and channel-fills are deposited under consistent conditions. At both locations, detailed sedimentological and ichnological observations were made using x-rays, grab samples, and point counts. Architectural observations were made using shallow reflective seismic in the Palix River, and with bathymetric sonar in the Little Ogeechee River. The main geographical difference

between the two is that the Palix River is an offshoot of the main Willapa Bay channel, and is thus protected from direct oceanic influences, while the Little Ogeechee River begins at the mouth of Ossabaw Sound, and has a much higher influence from oceanic processes. Correctly identifying and interpreting the depositional character of point-bars and channel-fill from the style of IHS deposits can be a useful tool for paleogeographic reconstructions and thus can be insightfully used in the rock record.

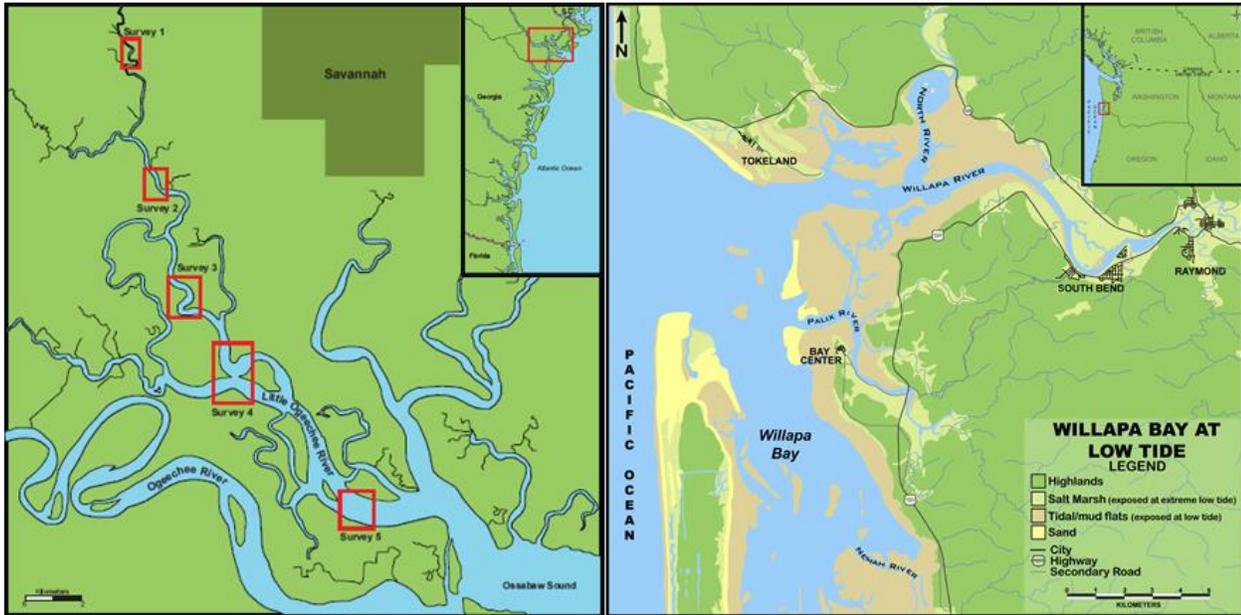


Figure 1: Location of Little Ogeechee River, Georgia, USA (left) and Palix River (right).

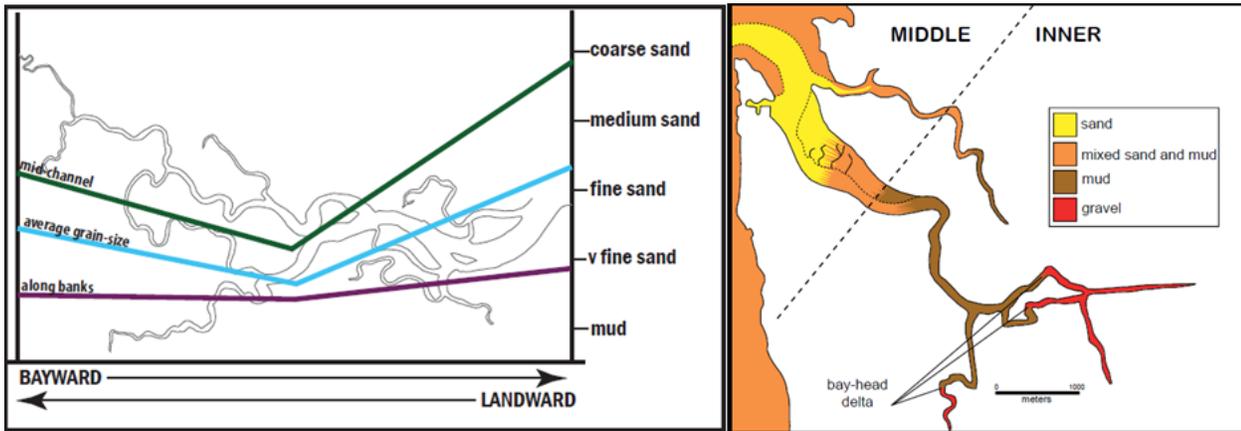


Figure 2: Sediment distribution for the Little Ogeechee River (left) and Palix River (right)

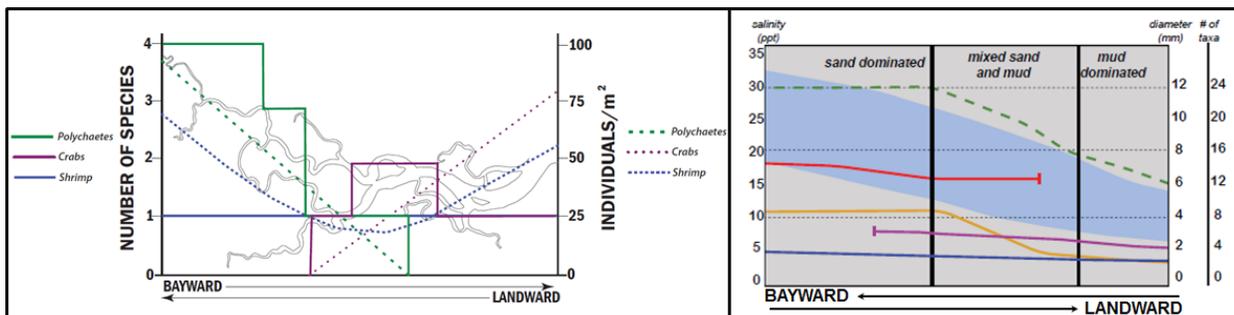


Figure 3: Ichnological distribution for the Little Ogeechee (*left*) and Palix River (*right*)

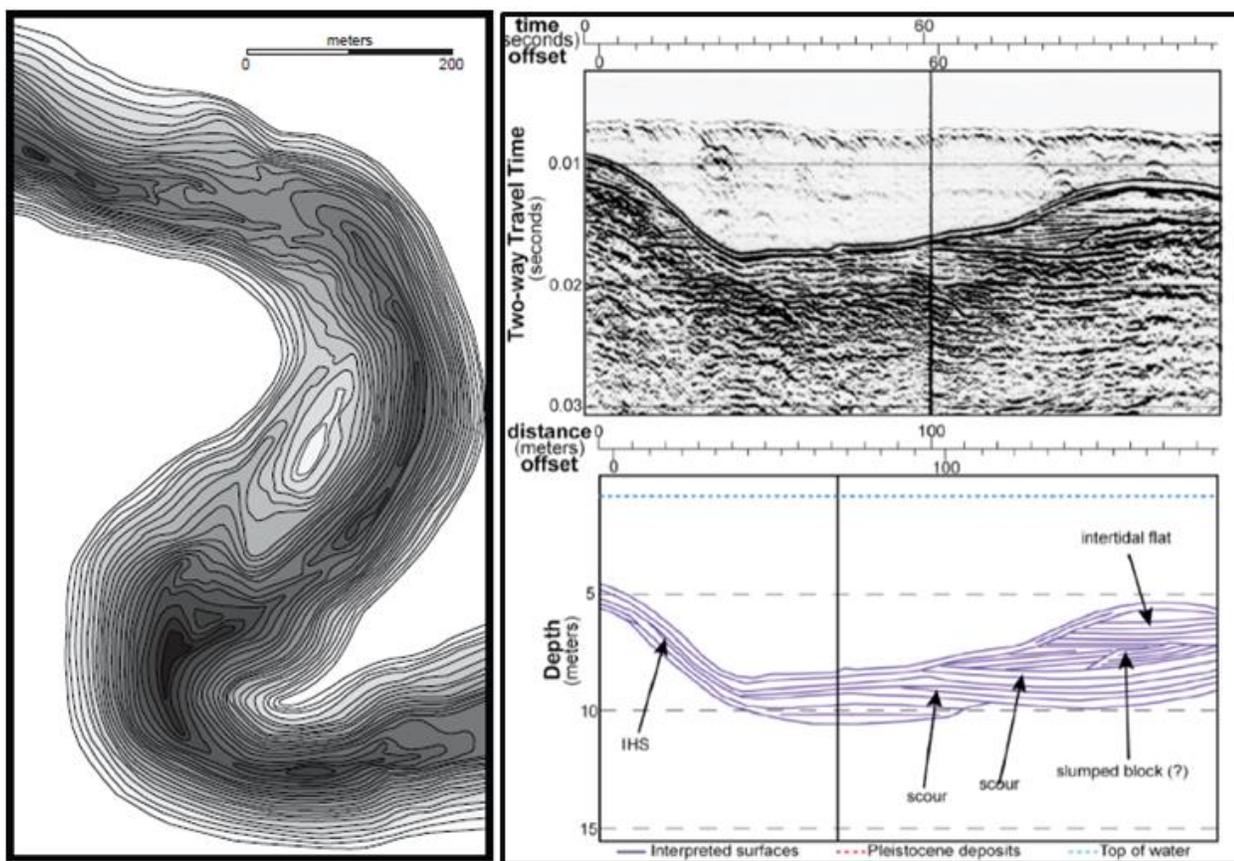


Figure 4: bathymetric map of a Little Ogeechee point-bar (*left*), and seismic image of a Palix River channel-fill (*right*) showing the different profiles of the two geobodies.