Establishing Geochronological Order of the Early-To-Middle Holocene Mississippi River Delta: Tiger and Trinity Shoals

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During the transgressive phase of delta building, a sediment starved delta lobe succumbs to subsidence and physical oceanographic processes, and is eventually reworked into a submarine shoal. Two such shoals, located on the western Louisiana inner continental shelf, are Tiger and Trinity Shoals. These neighboring submarine sand bodies are remnants of separate early-to-middle Holocene Mississippi River delta lobes. It is unclear, however, whether these shoals derive from the Maringouin Delta Complex or the Teche Delta Complex, or whether one shoal is assigned to each. One of our objectives is to evaluate the sedimentology, stratigraphy, and depositional history of Tiger and Trinity Shoals, so as to genetically link these shoals to their appropriate delta complex. An initial marine geophysical survey collected approximately 1,150 km of high resolution subbottom profiles (chirp sonar) across the Tiger and Trinity Shoal study area. Based on initial stratigraphic and geological interpretations of profiles, 46 vibracores with a maximum length of 4.5 m were extracted. Cores were logged and imaged using a GEOTEK core logger, described texturally, sampled at 50 cm intervals for grain size analysis, and sampled for various dating techniques. Preliminary results and interpretations reveal both similarities and contrasts between Tiger and Trinity Shoals. First, the sand fraction of both shoals fines with depth, and from east to west. However, the mean sand fraction of Trinity Shoal is entirely very-fine sand, whereas Tiger Shoal's mean sand fraction ranges from medium sand in its extreme eastern section to very-fine sand westward. Second, the base of Tiger Shoal is at a much higher subbottom elevation than is the base of Trinity Shoal. Third, the stratigraphic framework of the study area establishes Tiger shoal as both thinner and smaller in area than Trinity Shoal; hence, Tiger Shoal is volumetrically much smaller. Though research is ongoing, this study illuminates the retrogradational nature of shoal evolution, as well as the northern Gulf of Mexico's characteristic westward transport of sediment under prevailing southeast winds. Data suggest that Tiger Shoal was deposited post-Trinity Shoal, under higher sea-level conditions, and that its sediment delivery was on a much smaller scale and from a separate source.