SHORELINE CHANGES IN THE TIMBALIER BARRIER ISLAND ARC: 1887 - 1996

Terrebonne and Lafourche Parishes, Louisiana

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INTRODUCTION

The U.S. Geological Survey (USGS), in cooperation with the Coastal Research Laboratory in the Department of Geology and Geophysics at the University of New Orleans (UNO) and the Center for Coastal Energy and Environmental Resources at Louisiana State University (LSU), is investigating the processes of coastal erosion and wetland loss in Louisiana (Gallinger and others, 1983; Sallenger and Williams, 1989; Penland and others, 1992). Building on the USGS Louisiana Barrier Island Study (Williams and others, 1992), this USGS Open-File Report depicts shoreline changes between 1887 and 1996, which provides an 8.5-year update of McBride and others (1992).

The Timbalier Islands are located about 100 km southwestward of New Orleans (Figure 1). This barrier island chain is 70 km long and extends east from Cat Island Pass to Raccoon Pass. The Timbalier Islands represent a flooding barrier island system developed from the reworking and erosion of an abandoned distributary of the Lafourche delta complex within the Mississippi River delta plain (Penland and others, 1988). Island evolution is driven by sediment longshore transport and storm overwash, causing the island as a whole to migrate to the north and west. The present configuration of the Timbalier Islands consists of Timbalier Island to the west, Timbalier Shoal, and East Timbalier Island to the east. Timbalier Shoal, located between the two islands within Little Pass Timbalier, is a transient area of moving sand, which is colourful for some periods of measurement. The Gulf shoreline of East Timbalier Island has been armored by a rock revetment with a second overall constructed landward to an attempt to protect oil and gas facilities on the bayside.

In order to quantify shoreline changes since January 21, 1988, new vertical aerial mapping photography was acquired on December 9, 1996. The methods and transects used by McBride and others (1992) were used to insure data comparability of the new measurements and analysis (Plate 8). Table 1 presents the transect measurements of shoreline change for the Timbalier Islands. For gulfside change measurements, a negative (-) sign signifies landward movement or erosion and a positive (+) sign signifies a seaward movement or progradation. For bayside change measurements, a negative sign signifies a seaward movement or erosion and a positive sign signifies a landward movement or accretion.

Island evolution is predominantly driven by longshore sediment transport and storm overwash, causing the island as a whole to migrate to the north and west while slowly losing total area. Storm overwash predominates along East Timbalier and Timbalier Shoal, while longshore transport dominates at Timbalier Island. The highest rates of erosion occur on the eastern ends of each island and lessen along the Gulf shoreline toward the west. The bayside of the islands experiences edge-erosion caused by wave action from Timbalier Bay to the north. For long-term comparisons, area change data is more meaningful than lineal shoreline retreat along the Timbalier Islands because of the high rate of tidal migration. Island area has been significantly reduced by periodic severe freezes which killed extensive areas of black mangrove swamp, and hurricanes which significantly altered the landscape in a short period of time.

Between 1887 and 1996, shoreline change was dramatic along the entire length of the Timbalier barrier island arc (Plate 6). The land mass shifted by island migration so that many transects yielded meaningless data. The west end of Timbalier Island prograded 7,244 m to the west between 1887 and 1996 by longshore sediment transport and tidal formation to the east end of Timbalier Island. The east end of Timbalier Island was eroded 4,000 m to the east