DISCUSSION


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INTRODUCTION

Twenty-four kilometer long Dauphin Island, the largest and longest member of the Alabama–Mississippi barrier island chain, genetically is of composite origin. It formed in the late Holocene around and downdrift from a broad, slightly elevated Late Pleistocene barrier ridge (OTVOS, 1981; OTVOS and GIARDINO, 2004). The island is exposed to a moderately high gulf wave regime. The central and western sectors, ca. 20 km long, 200–450 m wide, represent a level subaerial sand belt, barely above sea level. Before the recent storm destruction episodes, this island sector was flanked by a continuous, narrow, 1–2 m high gulf foredune ridge. An engineered, un-vegetated “sand berm” ridge, constructed in 2000 along the developed east-central island sector of vacation homes to replace the previously destroyed gulf foredune (DOUGLASS, 2001), was soon washed away by waves of a mere winter storm.

Gulf-side foredune ridges have been repeatedly removed by tropical cyclones on Dauphin Island. Shore recession, landward overwash, flooding, and heavy wind damage accompanied the storms. Unlike central and western Dauphin Island, positive and negative shore changes have been relatively very minor along the high and broad eastern island sector. Somewhat inconsistently, FROEDE (2006) claims that without “continued” beach nourishment, Dauphin Island is no longer capable of healing storm damage in its allegedly “precarious” coastal setting. Historical data on the dimensions of past erosive and regenerative phases, comparisons with other barrier islands refute the idea that, unless reinforced by nourishment, natural sand transport processes are insufficient to neutralize storm damage to Dauphin.

DISCUSSION

Historical Changes in and Adjacent to Petit Bois and Dauphin Islands

A brief account of major island changes illustrates the magnitude of aggradational and erosive processes on Dauphin. A narrow 26-km low-supratidal sand belt linked Petit Bois Island’s broad, elevated strandplain sector with east Dauphin’s high and wide Pleistocene core area in the early 18th century (OTVOS and GIARDINO, 2004). This spit-like barrier sand belt was permanently breached by a subsequent tropical cyclone, permanently separating the two islands. By 1848 the cut that had become Petit Bois Pass widened to 2.6 km (HARDIN et al., 1976). Erosional recession gradually eliminated Petit Bois Island’s narrow 12-km eastern sector (MISSISSIPPI OFFICE OF GEOLOGY, unpublished data; WALLER and MALBRUGH, 1976). Between 1882 and 1974, the pass further widened from 2.4 to 7.5 km, migrating 12.4 km downdrift in the process. Dauphin advanced 2.7 km westward between 1917 and 1974, and its further growth narrowed Petit Bois Pass to 7.0 km. Dauphin Island’s total length fluctuated between 16.8 km (1882), 21.6 km (1908), and 6.0 km (1928). Nourished from abundant updrift and offshore sand sources and attaining 24 km length, Dauphin had by 1969 prograded to former eastern Petit Bois Island’s mid-19th century position (MISSISSIPPI OFFICE OF GEOLOGY, unpublished data; U.S. ARMY CORPS OF ENGINEERS, 1971). Major cyclones in 1906, 1916, and 1926 transformed large stretches of Dauphin into subtidal shoals. In the wake of the first of two powerful Mobile-area hurricanes in 1916, only a 5.2-km sector and small fragmented islets remained of central and western Dauphin (HARDIN et al., 1976, their figure 39). The 1926 hurricane converted 8.4 km of the island into subtidal shoals (U.S. ARMY CORPS OF ENGINEERS, 1971). Gulf-shoreline recession amounted to several tens of meters between 1942 and 1974 (HARDIN et al., 1976) and continued since (DOUGLASS, 2001, his figure 2). Narrow cuts (e.g., FROEDE, 2006, his figure 13) and wide breaches persisted for variable time periods following the 1939, 1948, 1979, 1998, 2004, and 2005, storm events, among others.

The contrast in erosive and recovery trends between central and western Dauphin and eastern Petit Bois has been remarkable. Lateral and onshore sand transport unfailingly repaired storm cuts on Dauphin during the last century and