BAR MORPHOLOGY ALONG THE MISSISSIPPI SOUND MARGIN

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INTRODUCTION

The microtidal, low wave energy, Mississippi Sound margins are characterized by an abundance of shoreface bars. Four distinct component bars can be identified, though interference patterns are common Vertical air photos, taken since 1945, and numerous overflights and field measurements during the last two years, have demonstrated that the equilibrium bar configuration at any given site is time-invariant. During storms, however, the bars go through cycles of change. The bars increase and decrease in height in response to annual changes in the prevailing winds. Prevailing southeasterly summer winds appear to enhance the relief of bars along the southeastward-facing mainland margins. The bar pattern and the associated steep beach slope suggest that they form in response to a standing-wave pattern established through interference between incident wind waves and waves reflected from the beach face.

BAR TYPES

Based on plan geometry the following four bar types are identified (fig. 1)

Multiple (5 or more) longshore bars (fig. 1A)

Multiple longshore bars, without interference from other bar types, occur on the low tide platform in front of a steep beach face, along shoreline segments of convex plan form. The bars have a sinusoidal cross-profile, are generally about one half meter high and have a spacing of about twenty meters.

Transverse bars (fig. 1B, C, D).

Bars oriented at steep angles relative to the shoreline dominate the sandy margins of Mississippi Sound. On the Sound shore of Horn Island simple transverse bars are common. Elsewhere along the sound shores of the other islands, an interference-bar pattern exists. This interference is typically between large transverse bars migrating in one direction and much smaller, and more closely spaced bars, moving the opposite way (fig. 1C). The sandy mainland shoreface of Mississippi Sound, on the other hand, is dominated by intersecting transverse and multiple longshore bars (fig. 1D).

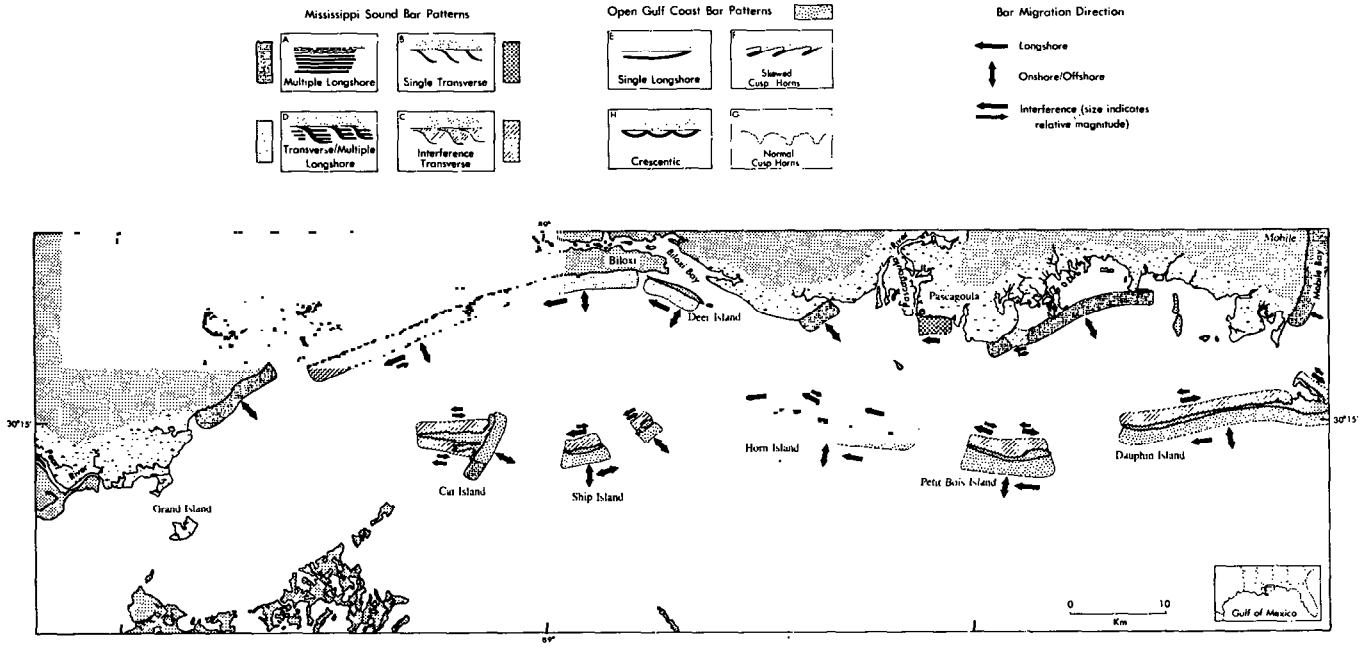

Figure 1. Distribution and types of shoreface bars in Mississippi sound.

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Open Gulf bars (Fig. 1E, F, G, H).

The Gulf beaches of the Mississippi-Alabama coast are characterized by a higher-energy suite of bars, distinctly different from those along the interior margins of the Sound. The open-Gulf bars undoubtedly go through cycles of erosion and accretion, as documented for bars in Australia by Short (1979). A total of four types have been identified in the region:

(1) single longshore bars, all attached to shore at their eastern end (fig. 1E) dominate the shores from Ship Island east to Petit Bois Island;
(2) skewed cusp horns (fig. 1F) and shore normal cusp horns (fig. 1G) are the most frequent bar types encountered at the eastern ends of Dauphin, Petit Bois, and Cat Islands;
(3) crescentic bars (fig. 1H) are ephemeral along the Gulf Coast beaches, but are well developed adjacent to shore-normal structures (for example, the entrance jetties to Perdido Pass on the Alabama-Florida state line).

Bar migration patterns

Transverse bars are characterized by a steep face dipping in the direction of bar advance. The bars migrate in the direction indicated by the obtuse angle between the bar and the beach (arrow in fig. 1B). Mapping of bar migration directions within Mississippi Sound reveals an interesting pattern of migration divergence at mid-Petit Bois Island. In the western Sound the migration is uniformly westward, coinciding with the direction of the prevailing longshore wave-energy flux. Eastward migration is limited to the eastern part of Petit Bois Island and Dauphin Island, shorelines where the long western fetch compensates for the less frequent westerly winds (Chew, 1964).

REFERENCES

Chew, F., 1964, Sea level changes along the northern coast of the Gulf of Mexico: Transactions, American Geophysical Union, v. 45, no. 1, p. 272-280.

Short, A.D., 1979, Wave power and beach stages: a global model: Proceedings, 16th Coastal Engineering Conference, Hamburg, Germany, p. 1145-1162.