

Impacts of climate-induced mangrove expansion on the ecological functions of salt marshes

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Abstract

The advancement of species poleward, presumably due to global climate warming, has recently been documented in several regions of the world. In coastal ecosystems, one unique distributional shift is the movement of *Avicennia germinans* (black mangrove) northward into temperate *Spartina alterniflora* salt marshes. In the Mississippi River Delta Complex of the northern Gulf of Mexico, black mangroves were historically restricted to the southernmost barrier islands and beaches by winter freeze events; however, in recent years a noticeable expansion has been observed. Given the sparse documentation of the ecosystem-level effects of black mangroves expansion within coastal salt marshes, our goal was to quantify the impacts of this expansion on ecological processes including surface sediment accretion, organic matter production, organic matter decomposition, and carbon assimilation, as well as several edaphic characteristics. Our results indicate that presently black mangrove expansion has had no major impacts on the ecosystem processes we measured. Sediment accretion rates, belowground production, decomposition rates, and carbon assimilation were similar between *Avicennia* and *Spartina* stands located within the same hydrologic setting. While decomposition rates were similar between habitats, mangrove leaves and roots decomposed more quickly than *Spartina* leaves and roots. Some differences were documented in edaphic parameters between habitats. Elevation, redox potential, bulk density, and soil ammonium were slightly higher, while soil moisture and porewater salinity were somewhat lower, where black mangroves had expanded into the surrounding salt marsh. Because the expanding black mangrove stands are small in stature as well as areal extent, significant effects on ecosystem processes may presently be muted. However, if stands continue to grow in vertical and horizontal extent, effects on ecosystem processes may occur in the future. Our research provides a baseline from which future ecosystem responses may be evaluated as mangrove populations continue to develop.

Keywords

climate change, ecotone, function, structure