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ABSTRACT

The overall goal of coastal wetland restoration is to achieve ecological equivalence through the reproduction of structural and functional characteristics. This study sought to examine ecological equivalence using a chronosequence of temporal replicates of created marshes using traditional structural measures of equivalence and tested the use of stable isotopes as a measure of functional equivalence. The objectives of this study were to: (1) compare measures of structural equivalence at created and reference marshes; (2) use stable isotope analysis of blue crab muscle and hepatopancreas tissues to compare functional equivalence at created and reference marshes; and (3) determine if there is any age effect indicative of marsh development trajectories. The study was carried out at four marshes created with dredged material (5–24 years old) that were each paired with adjacent reference marshes on the Sabine National Wildlife Refuge, Louisiana during the spring and fall of 2007. At each marsh, quantitative measures of structural equivalence and functional equivalence were collected. Paired contrasts indicated that created and reference marshes supported equivalent plant and nekton populations, but differed in soil characteristics. Specifically, created marshes had consistently lower soil organic matter compared to reference marshes with no apparent age effect. A laboratory study was conducted in order to determine blue crab tissue specific isotope turnover rates. The hepatopancreas tissue had a half-life of approximately 10 days while the muscle tissue had a half-life of approximately 22-39 days. Comparison of mean hepatopancreas and muscle $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotope values found that the blue crabs at the youngest created marsh (5 yrs.) occupy the lowest trophic position compared to all other marshes. Overall, the results indicate that while vegetation and nekton community characteristics suggest that structural equivalency is achieved relatively rapidly (< 5yrs), functional equivalence, as measured by trophic support, may take longer to occur (> 8 years). Stable isotope techniques may give coastal managers an important tool to investigate the complex trophic connections within these estuarine food webs and to determine if and when these marshes will achieve functional equivalence.