



Examination of coupling between primary and secondary production in a river-dominated estuary: Apalachicola Bay, Florida, U.S.A.

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ABSTRACT: To examine the influence of river-borne organic material on estuarine communities, we conducted a dual stable isotope study in an estuary heavily influenced by alluvial runoff. Despite significant alluvial influence, secondary production in Apalachicola Bay depends more upon estuarine primary production than upon a detrital food web supported by floodplain primary production. Two simple mixing models, floodplain-marine and floodplain-estuarine, indicated that the upper limits for the contribution of terrestrial organic matter to estuarine consumer diets averaged 37, 25, and 27% and 20, 19, and 25% for East Bay, Cat Point, and Dry Bar, respectively. Systematic $\delta^{13}\text{C}$ variation of consumer organisms was found for differing locations and attributed to increasing influence of terrestrial organic matter and ^{13}C -depleted dissolved inorganic carbon (DIC) closer to the river mouth. The $\delta^{34}\text{S}$ data exhibited significant variation with river flow that was attributed to an admixture of terrestrial floodplain detritus with estuarine and marine organic matter. Both $\delta^{13}\text{C}$ and $\delta^{34}\text{S}$ isotope data demonstrated clear distinctions between benthic and water column feeding types. Our results suggest that the estuary is dependent on riverine inflows to provide floodplain detritus during the high-flow period and dissolved nutrients for estuarine primary productivity during the low-flow season. Any alteration of river hydrology may adversely affect estuarine secondary production, especially during the low-flow period when the estuary is dependent on input of dissolved nutrients to maintain a high level of primary productivity.

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