



Sulfur stable isotope indicators of residency in estuarine fish

Brian Fry and Matthew M. Chumchal

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ABSTRACT: Estuarine fish may remain as residents in areas with favorable conditions for feeding and refuge, but become mobile and transient where conditions are less favorable. We developed a new approach involving sulfur stable isotope ($\delta^{34}\text{S}$) distributions in fish muscle tissue to track residents and transients across estuarine salinity zones. Salinity tracking was based on $\delta^{34}\text{S}$ contrasts between freshwater and marine waters. This 5-yr study of two Louisiana estuaries showed that riverine and upper-estuarine fish consistently had low $\delta^{34}\text{S}$ values (-5‰ to $+5\text{‰}$) in contrast to fish from the lower, more marine portion of estuaries that had higher $\delta^{34}\text{S}$ values (11 – 17‰). Residents were identified using tests of normality within community-level $\delta^{34}\text{S}$ distributions, and conceptually were considered animals permanently residing at the sampling station but also any animals present from nearby areas with similar salinities. Transients had $\delta^{34}\text{S}$ values atypical of both the location of capture and the local salinity regime. Results showed good resolution of fish movement at small 0.1–4-km scales for low-salinity (< 2) upper-estuary stations, and good detection of long-range migrants from the upper estuary into the lower estuary at a coarser spatial scale of 10–30 km. On an average basis, 2/3 of the estuarine fish fauna was resident and 1/3 transient. Transients were a minority in most species but commonly included small as well as large fish. This novel $\delta^{34}\text{S}$ approach may be a general technique for evaluating fish residency and movement across salinity zones in estuaries.

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