From water to biominerals: Identifying the factors driving the chemical incorporation into juvenile snapper otoliths through an *in situ* approach

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RESUMO

Otolith chemistry is an efficient tool for inferring fish natal origins and connectivity, in which signatures are assumed to reflect a complex interplay between water chemistry and other environmental and biological processes. Although laboratory experiments commonly have assessed the relationship between water and otolith chemistries, efforts through *in situ* samples remain poorly explored. Therefore, we aimed to assess how otolith signatures of juvenile dog snappers (*Lutjanus jocu*) are driven by environmental and biological variables within a dynamic estuarine nursery habitat. A range of chemical elements (Mg, Mn, Cu, Zn, Sr, and Ba) in the water and the otolith matrix were measured along the saline gradient and monthly for a year, covering distinct seasons. By applying generalized linear mixed models (GLMMs), we found that just water chemistry does not fully explain the otolith signatures, and other factors such as water temperature, fish length, and Fulton's index may be more relevant depending on each kind of element. For Mg:Ca, the negative relationship to Fulton's index was the strongest driver, likely due to changes in the individuals' metabolic activity. Both Mn:Ca and Ba:Ca were significantly positively related to the water temperature, while Sr:Ca was negatively related. As well, Ba:Ca was also statistically positively affected by the total length. The Zn:Ca model exhibited a low explanation by the fixed variables (1.4%), possibly due to confounding factors such as feeding and ontogeny. The otolith absorption differed between elements, with Sr and

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Ba partition coefficients being the most efficient, while Mg was the least. Our findings contribute to a better understanding of the ecological dynamics in the otolith elemental signatures, particularly in an estuarine habitat characterized by highly variable physicochemical parameters.

Palavras-chave: Otolith chemistry, Laser ablation, Lutjanidae, Environmental variables, Estuaries.