Making the otolith magnesium chemical calendar-clock tick - DTU Orbit (08/10/2018)

Making the otolith magnesium chemical calendar-clock: Plausible Mechanism and Empirical Evidence

The incorporation of a number of readily measured trace elements into otoliths is considered to be under some sort of physiological control, but rarely are explicit mechanisms proposed. Studies of the incorporation of the trace element magnesium reveal that in some taxa there exists strong seasonal patterning, taking on the characteristics of a “chemical calendar-clock.” However, Mg/Ca and the isotopic ratio $^{26/24}\text{Mg}$ are less “clock-like” in taxa that are not as metabolically active. Herein, it is hypothesized that Mg uptake and incorporation are related to metabolic activity. Further, a two-step process of Mg incorporation is proposed: (1) limited entry into the otolith-bearing chamber through ion channels and (2) association with water-soluble proteins within the chamber. Supporting data from a range of taxa and life histories are provided; the authors’ aim is to stimulate discussion and encourage physiologists to test these and alternative mechanistic hypotheses.

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