




# FISH EAR STONES TRACK HYPOXIA EXPOSURE

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## Study Description

Hypoxia can severely impact marine and aquatic ecosystems worldwide, but the importance of sublethal effects on organisms that experience low oxygen and survival is difficult to quantify. Here, the authors used internal geochemical tags in fish ear stones (otoliths) to quantify hypoxia exposure in the Gulf of Mexico and food web responses with stable isotopes. They found that fish responses were variable, and hypoxia exposed fish had larger feeding niches because some individuals were displaced from hypoxia and others were not. Complex responses to hypoxia must be understood to predict ecosystem resilience to this growing environmental stressor.

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Photo 1: Collections of Atlantic croaker (*Micropogonias undulatus*) from the northern Gulf of Mexico. Photo credit: Matthew E. Altenritter.

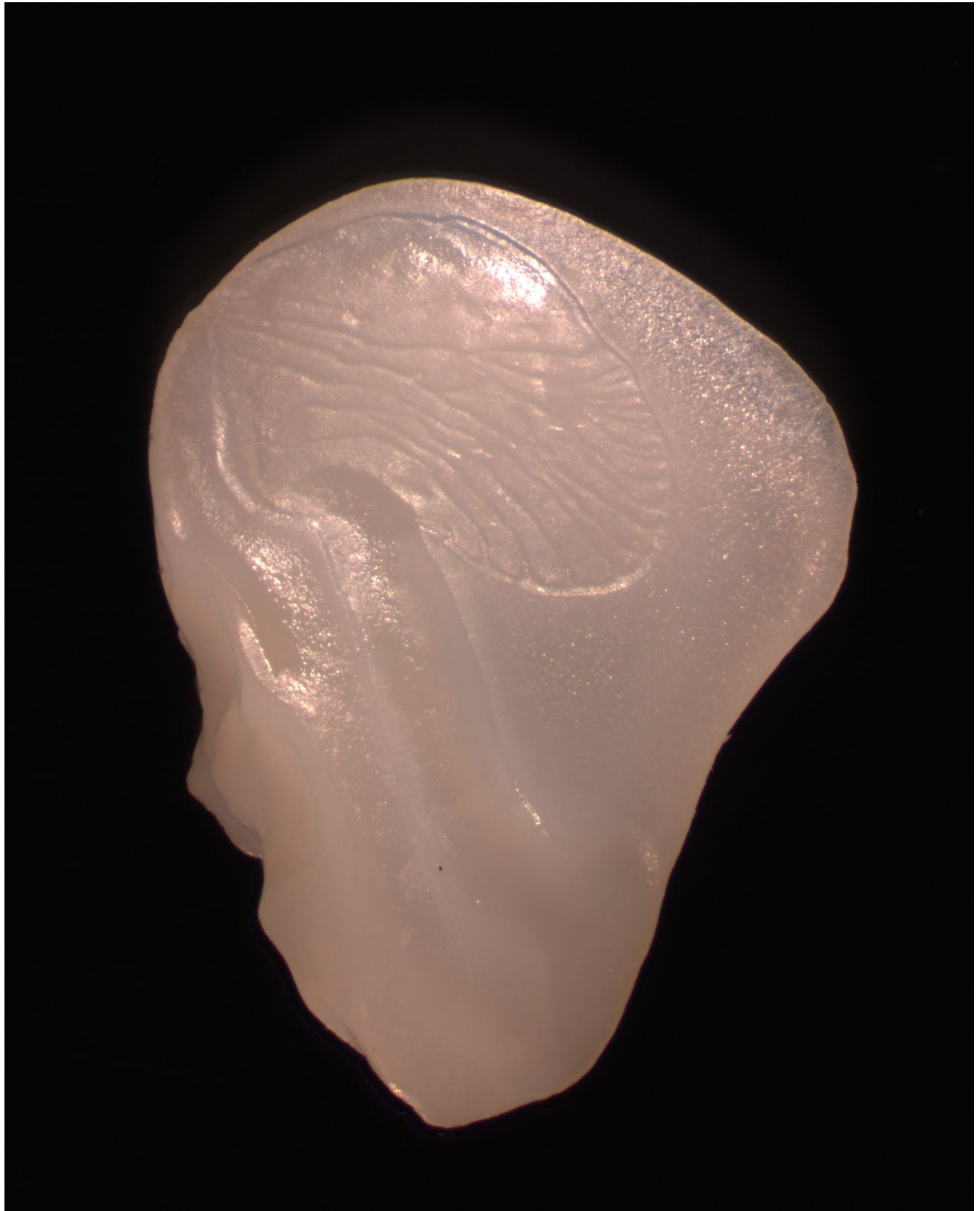


Photo 2: Whole fish otolith (ear stone) found in the inner ear complex of a studied fish. Photo credit: Matthew E. Altenritter.



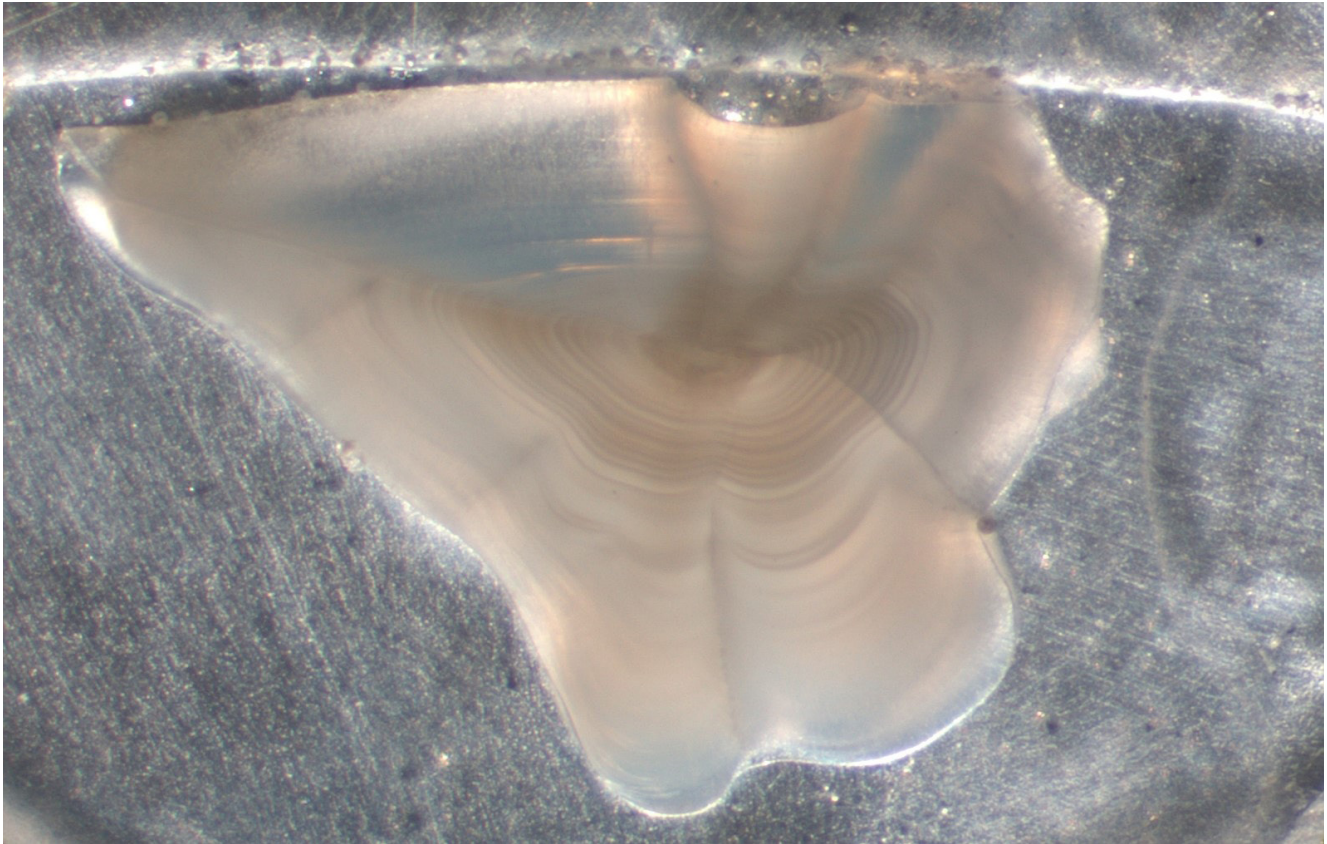


Photo 3: Sectioned fish otolith (ear stone) showing growth increments. Photo credit: Matthew E. Altenritter.

These photographs illustrate the article “Distributive stress: individually variable responses to hypoxia expand trophic niches in fish” by Tyler R. Steube, Matthew E. Altenritter, Benjamin D. Walther published in *Ecology*. <https://doi.org/10.1002/ecy.3356>.