{rokbox title=|Panel of otoliths showing placement of pits on larval otoliths post-analysis via SEM imaging :: Image: Authors| thumb=|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-first-application-secondary-reglero-2026-thumb-et-al.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-first-application-secondary-reglero-2026-et-al.jpg{/rokbox}

Alanna Mnich, Mingming Zhang, Trika Gerard, **Patricia Reglero**,Steven X. Cadrin,Mark Altabet,2026. **The first application of secondary ion mass spectrometry for the analysis of δ18O in otoliths of larval fish** .Limnology and Oceanography: Methods.Volume24.Issue3.March 2026. https://doi.org/10.1002/lom3.70016

Abstract: The stable isotope ratio of oxygen (δ18O) stored in otoliths is a common and reliable tool for studying life history events including natal origin and migratory behavior of marine fish species. This approach is useful particularly in cases where traditional tagging is impossible, such as in early larval stages. However, small amounts of available otolith material have historically precluded analysis of δ18O in individual larval otoliths by traditional isotope ratio mass spectrometer (IRMS). The use of secondary ion mass spectrometer (SIMS) resolves this challenge, allowing users to obtain δ18O signatures in otoliths at the scale of tens of microns. This paper presents a method for the preparation of larval fish otoliths compatible with SIMS δ18O analysis through placement of larval otoliths (~ 20 to ~ 150 μm diameter) on a single epoxy mount and use of a Cesium ion beam, 133Cs+, of 12 μm in diameter with 1 μm penetration depth to excite source larval otolith material. In this pilot study, otoliths from Atlantic bluefin tuna (Thunnus thynnus) larvae were used to assess the efficacy of generating quality δ18O data using the newly developed preparation method for establishing spawning site baselines. The applied methods led to usable δ18O signatures in > 90% of the otoliths selected for analysis. Challenges and unanticipated considerations that became apparent during the use of this method include the inverse relationship between 16OH−/16O−, an indicator of hydrogen content, and δ18O, resulting in a limitation of using otoliths from preflexion larvae, as well as a statistically significant difference in δ18O (−0.17‰) after storage in Type B immersion oil.

Keywords:Larval fish,Otoliths,Marine fish species,Larval stages.