Otolith Shape Analysis: a useful tool for identification of cryptic flatfish (Teleostei, Pleuronectiformes: Soleidae)

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Abstract
Flatfish are an important commercial fish group along the Mediterranean Sea coasts. Among them, *Solea aegyptiaca* and *S. solea* are cryptic species that coexist in the Adriatic and Aegean Seas and are likely sympatric in other areas, but often go undetected due to misidentification. Morphological differentiation between the two species has been challenging, though traits such as the number of vertebrae and the posterior of dorsal and anal fins could assist. Here, we investigate the utility of otoliths (sagittae), mineralized structures of the inner ears of teleosts which are usually species-specific, in distinguishing between the two soles from Central Greece. Our approach is based on right otoliths from 164 specimens and involves contour analysis based on wavelet transform, implemented in the ShapeR package for R and comparative statistical analyses. Our results showed that significant differences were detected among the two species, which could be traced at the anterior part of the otoliths. Moreover, a model based on the shape differences could discriminate the two soles with 82% accuracy. Our results reinforce the distinction between *S. aegyptiaca* and *S. solea* and underscore the reliability of the method for accurate species identification. Precise species identification is crucial for effective fisheries management and conservation efforts in the Mediterranean region, ensuring that each species' population dynamics are properly monitored and managed.