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Using the shape of sgitta otoliths in the discrimination of phenotypic stocks in *Scomberomorus sierra* (Jordan and Starks, 1895)

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Geometric morphometric analysis was used to evaluate the shape of complete and broken otoliths in stock discrimination of *Scomberomorus sierra*. Data come from three different fishing locations in the mouth of the Gulf of California. Of the 70 otoliths pairs from location, 35 were broken. On the Complete Otoliths (CO) image 41 marks were located and 31 on Broken Otoliths (BO), the latter lacking rostrum. To evaluate the potential loss of BO resolution, the last 10 marks were eliminated from the CO and a third set of information was integrated as Virtually Broken Otoliths (VBO). The effect of the size, position and orientation of the spatial configurations of the otoliths were eliminated through the procedure of Procrustes superimposition. A canonical variable analysis detected significant differences ($p < 0.05$) in the three data sets and the distribution of the scores indicated a clear separation of the three groups, suggesting a morphologic difference of the otoliths from the three fishing locations. Also, the pairwise differences based on the Procrustes distances were statistically significant in all cases ($p < 0.05$). In agreement with Mahalanobis distances, the average percentage of correct assignation varied from 89% in CO and VBO to 80% in BO. It is ruled out that the morphologic differences are attributed to an allometric effect, since, in none of the cases the size of the centroid showed a significant correlation with the canonical axes. The present study constitutes an important referent to maximize the use of the information about otoliths, which due to their fragility break during extraction and manipulation.

Palabras clave: Specialist, *Scomberomorus sierra*, Otoliths, Pacific sierra, Geometric Morphometrics

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