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Abstract

Otolith Fingerprint and Shape of the Chub Mackerel (*Scomber colias*) in the Southwestern Atlantic Ocean †

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Abstract: The mackerel (*Scomber colias*, Gmelin 1789) is a shoal-forming scombrid that inhabits the coastal waters of the Atlantic Ocean. The species can be found at depths of up to 300 m, but often inhabits the warmer, shallower waters of coastal regions in its migration to feeding and spawning grounds. In the southeast and south of Brazil, the commercial capture of this species is achieved by purse seine fleets, with great fluctuations in the catch from one year to the next. In Brazil, a single stock of *S. colias* was considered for fishery management purposes. However, the species is not covered by any specific regulatory act in the Brazilian fisheries legislation. The aim of this study was to evaluate the homogeneity of fish stocks of the mackerel *S. colias* on the continental shelf of southeastern and southern Brazil, through an analysis of the shape and elemental chemical signatures of otoliths. The data used are from nine samples from fishing landings and scientific observers in the purse seine fleets that went out between 2008 and 2020. Multielemental signatures (^{44}Ca, ^{7}Li, ^{26}Mg, ^{55}Mn, ^{88}Sr, and ^{137}Ba) of whole otoliths was performed by Inductively Coupled Plasma Mass Spectrometry, and otolith shape patterns were obtained through wavelet coefficients and shape indices, for the Santa Catarina (SC), São Paulo (SP), and Rio de Janeiro (RJ) regions. The results of multivariate analysis (PERMANOVA, $p < 0.05$) for otolith chemistry showed differences between regions, which were confirmed in the pairwise test. In the Canonical Analysis of Principal Coordinates (CAP), with reclassification by the leave-one-out diagnosis, the individuals were assigned to their collection regions, with accuracies of 74% (SC), 90% (SP), and 65% (RJ), and global reclassification of 73%. The results for otolith shape alone showed no differences between the SC and SP samples, and individuals were assigned to their collection regions with lower precision (SC: 54%, SP: 70%, and RJ: 60%). When the otolith shape and chemical analyses were combined, the reliability of the results did not increase. This study indicates that mackerel stocks are not homogeneous in the continental shelf area of the southeast and south of Brazil.

Keywords: Scombridae; otolith microchemistry; otolith shape analysis

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