

Investigating Population Structure of Sea Lamprey (*Petromyzon marinus*, L.) in Western Iberian Peninsula Using Morphological Characters and Heart Fatty Acid Signature Analyses. PLoS ONE 9(9): e108110. doi:10.1371/journal.pone.0108110

Abstract

This study hypothesizes the existence of three groups of sea lamprey *Petromyzon marinus* L. in Portugal (North/Central group, Tagus group, and Guadiana group), possibly promoted by seabed topography isolation during the oceanic phase of the life cycle. Within this context, our purpose was to analyze the existence of a stock structure on sea lamprey populations sampled in the major Portuguese river basins using both morphological characters and heart tissue fatty acid signature. In both cases, the multiple discriminant analysis revealed statistically significant differences among groups, and the overall corrected classification rate estimated from cross-validation procedure was particularly high for the cardiac muscle fatty acid profiles (i.e. 83.8%). Morphometric characters were much more useful than meristic ones to discriminate stocks, and the most important variables for group differentiation were eye length, second dorsal fin length and branchial length. Fatty acid analysis showed that all lampreys from the southern Guadiana group were correctly classified and not mixing with individuals from any other group, reflecting a typical heart fatty acid signature. Our results revealed that 89.5% and 72.2% of the individuals from the Tagus and North/Central groups, respectively, were also correctly classified, despite some degree of overlap between individuals from these groups. The fatty acids that contributed to the observed segregation were C16:0; C17:0; C18:1 ω 9; C20:3 ω 6 and C22:2 ω 6. Detected differences are probably related with environmental variables to which lampreys may have been exposed, which led to different patterns of gene expression. These results suggest the existence of three different sea lamprey stocks in Portugal, with implication in terms of management and conservation.

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