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Abstract

Geometric Morphometrics Approach to Assess Population Structure of Salema (*Sarpa salpa*) in the Northeast Atlantic Portuguese Waters †

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† Presented at the XI Iberian Congress of Ichthyology, Vila Real, Portugal, 23–27 June 2026.
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Abstract

Introduction: Understanding population structure is essential for fisheries management and stock identification. In marine species, spatial differentiation may arise from environmental conditions and biological factors, even when populations appear continuous. Otolith shape and body analyses have been widely used as effective tools to detect such differences, as they reflect both genetic and environmental influences. **Objectives:** The main objective of this study was to assess the population structure of *Sarpa salpa* in three fishing grounds in the Northeast Atlantic using two geometric morphometric approaches. **Methodology:** A total of 133 individuals collected between November 2025 and March 2026 from Santa Maria (n = 48), Peniche (n = 36), and Olhão (n = 49) were analyzed using two geometric morphometric approaches. The first involved otolith contour analysis using Elliptical Fourier Descriptors (EFD), with 12 descriptors explaining 90% of the cumulative variance. The second approach used truss network analysis based on 11 body landmarks, corresponding to 22 transformed distances (TD). Statistical analyses included multivariate analysis of variance (MANOVA), Hotelling's T-square tests (HT2) for multiple comparisons, and linear discriminant function analysis (LDFA), with reclassification success assessed using a jackknifed (leave-one-out) classification matrix (JKM). **Results:** EFD analysis showed significant differences for MANOVA, with significant HT2 between all locations, but LDFA indicated considerable overlap, with a global JKM reclassification rate of 60%. In contrast, TD also showed significant MANOVA results, with significant HT2 across all comparisons. However, LDFA demonstrated clear separation among the three groups, achieving a JKM overall reclassification success of 98%. **Conclusions:** The results indicate that geometric morphometrics based on body landmarks provides greater discriminatory power than otolith contour analysis for identifying population structure. These results suggest the existence of distinct population units of *Sarpa salpa* in the Northeast Atlantic, highlighting the importance of spatially explicit approaches for fisheries assessment and management.

Keywords: fish stocks; Atlantic South-West; natural tags; truss network

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Academic Editor: João S. Carrola

Published: 17 June 2026

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Author Contributions: Conceptualization, A.T.C.; Methodology, R.R.T., R.G.K., R.M.S. and A.T.C.; formal analysis, R.R.T., R.G.K.; R.M.S. and A.T.C.; investigation, R.R.T. and A.T.C.; resources, A.T.C.;

data curation, R.R.T., R.G.K., R.M.S., R.V.S.S. and A.T.C.; writing—original draft preparation, R.R.T.; writing—review and editing, R.R.T. and A.T.C.; visualization, R.R.T., R.G.K., R.M.S. and A.T.C.; supervision, A.T.C.; project administration, A.T.C.; funding acquisition, A.T.C. All authors have read and agreed to the published version of the manuscript.

Funding: This project was financially supported by Portuguese funds through FCT—Fundação para a Ciência e a Tecnologia, I.P., and by the European Commission's Recovery and Resilience Facility, within the scope of UID/04423/2025 (https://doi.org/10.54499/UID/04423/2025), UID/PRR/04423/2025 (https://doi.org/10.54499/UID/PRR/04423/2025), and LA/P/0101/2020 (https://doi.org/10.54499/LA/P/0101/2020). This work is also a result of the project ATLANTIDA II (ref. NORTE2030-FEDER-01799200).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Available upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

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