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Validation of growth increment formation and first annual increment formation in European anchovy (*Engraulis encrasicolus*) in the Northwest Atlantic Area

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Introduction and Objectives

Several studies on anchovy age and growth validation have been published, mainly in Bay of Biscay, Gulf of Cadiz and in NW Mediterranean but no data exists for the western Iberian population. Anchovy had a residual abundance in the past in the upwelling area, which was clearly dominated by sardine. Anchovy had an exponential increase in abundance in recent years, with consequent increase for local fisheries, especially the purse seine fishery.
It is importante to study the biology and ecology of this population, to improve fisheries management.
The present work attempts to validate the periodicity of formation of the growth increments on anchovy otoliths by means of Marginal Increment Analysis (MIA) and Edge Type Analysis. Also we validate the first annual increment deposition based on otolith microstructure analysis.

Material and Methods

Monthly samples anchovy from commercial catches and research surveys of NW Portugal c were colleted during 2017, 2019, 2020 and 2021, and the otoliths of randomly selected age 1 and 2 individuals was analysed. Otoliths were mounted and photographed, and age was assigned according to (1) criteria, and edges were classified as opaque (O) or hyaline (H), according to the criteria described in (2) and MIA was calculated following (3). A total of 337 otoliths were used in the analysis. For microincrement analysis a total of 19 otoliths were analized and microincrements were measured according to the guidelines in (4) and (5).

Results

Monthly proportion of edge type indicates an annual periodicity in the formation of the hyaline and opaque annuli, with opaque edges mainly appearing from May to October (no samples available in December) (Fig.1a).The hyaline annulus seems to be formed from November to March (Fig.1a).
The small sample size prevents to clearly identify differences in the formation of opaque edge when considering age classes (Fig.1b).
Higher values of MIA were observed in summer months and early fall with the dominance of opaque edge (Fig.1).
The gradient in the opaque edge formation seems in line with results from other areas (Fig.2).
The width of increments pattern shows a first zone increasing from 1 to 10 µm at 50 days, while after this age thewidth decreases slowly to reach 5 µ at 150 days (Fig.3).

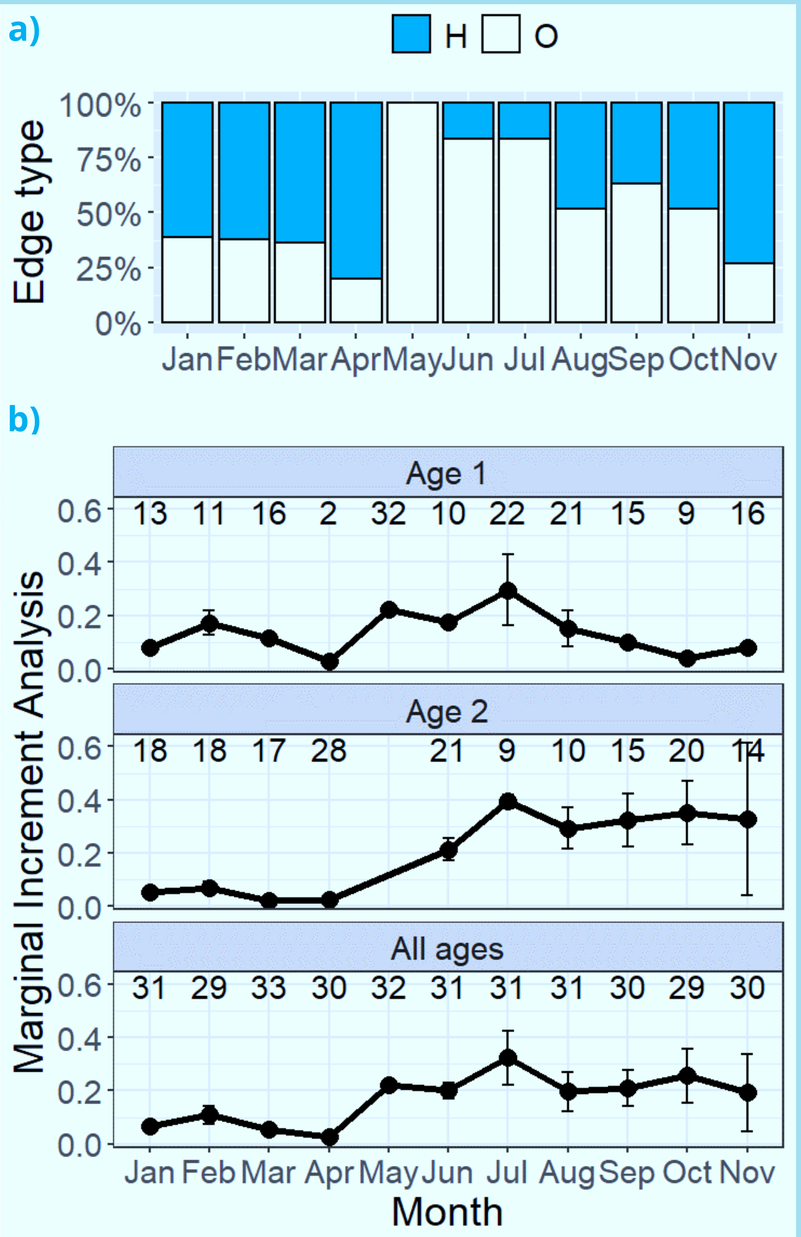

Figure 1. Monthly variation of anchovy (a) edge type analysis, hyaline (H) and opaque (O); (b) marginal increment analisys (MIA) by age classes and all ages combined, numbers on top correspond to sample size. The vertical lines are the variation.

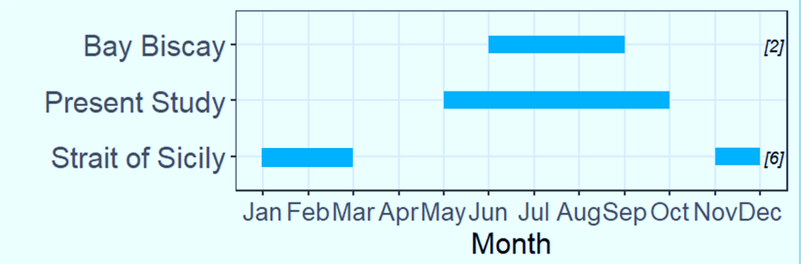

Figure 2. Monthly periods of opaque edge formation (beginning to end) of anchovy in different areas of NE Atlantic and Mediterranean Sea. Numbers correspond to bibliographic references from each area study (see References).

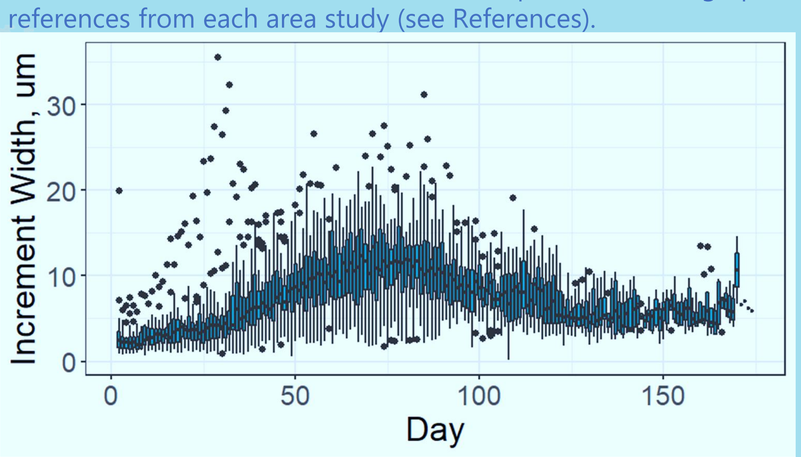

Figure 3. Otolith mean increment width vs. age (days) for anchovy individuals. The boxplots represent the median, 1.5× the interquartile range, minimum and maximum and outliers.

Discussion and conclusions

The opaque edge, MIA and increments width pattern are in line with other studies wich give some support to our results.
This analysis needs to be improved: add more samples size, the opaque edge formation along different age classes, the frequency distribution of the distances from the otolith nucleus to growth increments will be considered.
Age and growth studies are fundamental to allow more robust assessments in the future. The results presented in this study provide important data for improved anchovy assessment and management in the future.

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