

A COMPARISON OF THE PRECISION OF RED MULLET (*MULLIDAE*) AGE DETERMINATION BY THE USE OF DIFFERENT BONY STRUCTURES AT THE STRAIT OF GIBRALTAR REGION

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Abstract

The goal of this study was to determine the most reliable bony structures (scales, whole and broken otoliths) for ageing the striped red mullet at the strait of Gibraltar region. The results showed for all structures a high percentage of agreement between the young individuals age readings carried out by observations of whole and broken otoliths; the age determined for old individuals by scales and whole otoliths seemed underestimated.

Keywords: Strait Of Gibraltar, Fisheries, Population Dynamics, Growth

Introduction

The striped red mullet (*Mullus surmuletus* Linnaeus, 1758), is one of the most commercially important fish species targeted by trawl fishery at the Moroccan waters. The area of study extends from the Strait of Gibraltar to Larache region. The accumulating evidence that scales can provide unreliable estimates of age has forced fishery scientists to use other calcified structures, especially otoliths [1]. Thus, the specific objectives of this study were to determine the precision of age estimated for this species using different hard structures.

Materials and methods

The samples of data used in this study were collected in 2005 by commercial category (small, medium and big), using a stratified random sampling of monthly commercial landings of trawlers made at the fish auction of Larache.

Samples of 114 individuals, ranging in size between 12 to 28 cm, were measured by their fork length to the nearest centimetre. In the laboratory; fish scales and sagittal otoliths by length class of 1 cm were removed from each fish and were washed and stored dry [2]; for age determination, Scales, whole and broken otoliths through the focus were illuminated with reflected light and were examined under a dissecting microscope with a dark background [3].

The readings were done without knowledge of scales or otoliths reference (length). All samples of scales and otoliths were interpreted separately three times. If all the three readings are different, the material is rejected. Only complete hyaline zones were counted using Guidelines for pattern interpretation generally based upon standardized interpretation presented in the CARE Age Reading Manual [4].

Several measures were used to determine the precision (reproducibility) of ages assigned using these structures. The Percent of Agreement (the percentage of age readings that agree with the modal age which represents the age for which most readings agree), the standard deviation (sd) and the coefficient of variation ($CV = 100 \times sd/mean$) [5], were used. Age readings were analyzed with a spreadsheet developed by Guus Eltink [6].

Results

The results show that the Percent of Agreement (P.A.) decreased for all structures over age 5 and indicate that precision (CV) between readings using whole otoliths remains slightly high as assigned ages increased (Table 1). For the scales, whole and broken otoliths CV's increased with increasing fish age, indicating that readings agreement decreased as fish grew older. However, the age reading agreement for whole otoliths kept high even for older individuals.

Tab. 1. Comparison of readings P.A. and CV among ages assigned using scales, whole and sectioned otoliths for two groups of striped red mullet

Age/ Structure	Sample size	Scales		Whole otoliths		Broken otoliths	
		PA (%)	CV	PA (%)	CV	PA (%)	CV
Fish with age less or equal to 5 years	75	67.04	14.98	82.52	11.86	95.14	5.13
Fish with age greater than 5 years	39	59.17	26.45	68.72	21.15	83.46	10.48

Discussion and Conclusions

The results of the study show that the determination of age by the use of whole otoliths and scales is less precise by comparison to that estimated from broken otoliths. In general, we found that broken otholith yielded the most precise age estimates for red mullet. Whole otoliths was equally useful for ageing the species but only for individuals not old (less or equal to 5 years);

over this age, the ages determinations using both scales and whole otoliths are underestimated by comparison with broken otoliths. Studies have consistently shown higher precision in ages assigned with otoliths than with scales in walleyes [7].

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