

AGE DETERMINATION AND PRELIMINARY GROWTH PARAMETERS OF ROUND SARDINELLA (*Sardinella aurita* Valenciennes, 1847) OFF NORTHWEST AFRICA

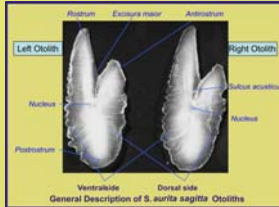
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INTRODUCTION

- In order to assess the resources of Round Sardinella (*Sardinella aurita*) of North West Africa waters through analytical methods, the F.A.O. (Food and Agriculture Organization of the United Nations) has strongly recommended that the age of this species is determined.
- To achieve that, three otolith exchanges (2002, 2003 and 2006) and two workshops (2003) have been carried out.
- The age determination of Round Sardinella is very difficult due to the high opacity of the growth rings of the otoliths, their structure not being calcified in some cases, and also to the presence of false rings in the scales.
- We present a summary of the extraction-mounting and age interpretation method as well as an "Intra and Inter Reading" analysis for both structures, otoliths and scales.
- In spite of the above mentioned difficulties, we also present an estimation of the growth parameters fitting the length-age pair values to the von Bertalanffy growth function.
- The samples were obtained from the landings in Gran Canaria (Canary Islands) from the UE pelagic trawlers that had been fishing in Mauritanian waters during 2005.
- A total of 1 873 otoliths and 1 162 scales from January to November (except for March) were analysed. Specimens ranged between 13.0 cm and 39.5 cm (total length).



AGE INTERPRETATION

- Observations of otoliths under reflected light were made using a binocular with 20x magnification
- Scales were observed with a profile projector
- The fish length was unknown in order to avoid influence in the age attribution

The age interpretation criteria applied was the previously established and presented in FAO (2007):

- The date of birth adopted is the 1st January
- One year is equivalent to a consecutive opaque and translucent ring (=annulus)
- The basic characteristic to take into account for the first annual ring is continuity around the entire otolith body
- If sardinella is caught during the year with an opaque zone on the otolith edge the age assigned is equal to the number of annuli
- If sardinella is caught in the first quarter with a translucent ring on the otolith edge the age assigned is equal to the number of annuli observed
- If sardinella is caught in the second quarter with a translucent ring on the otolith edge two situations can occur:
 - big translucent increment that started settling the previous year. In this case the age assigned is equal to the number of annuli observed.
 - translucent ring at edge is very narrow meaning that the formation of this ring started that year and should not be considered
- If sardinella is caught in the third and fourth quarters with a translucent ring on the otolith edge the age assigned will be equal to the number of annuli observed minus 1.

A reliability of between 1 and 4 was assigned, depending on the confidence placed in the reading:
1 (completely unreliable), 2 (unreliable), 3 (reliable), 4 (very reliable).
When the reliability was 1 the age assigned was rejected.

OTOLITHS EXTRACTION AND PREPARATION

After extraction otoliths (*sagitta*) were washed, dried, mounted and preserved in black plastic plaques in a synthetic resin (© Eukitt) labelled with the date and number of specimens

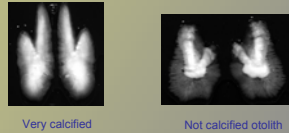
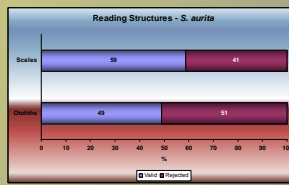


SCALES EXTRACTION AND PREPARATION

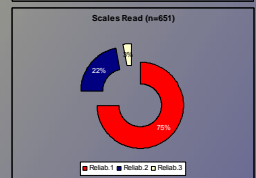
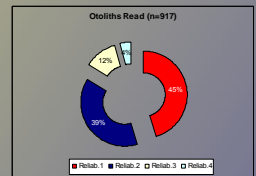
Four or five scales were removed from the left shoulder of the fish between the head and the dorsal fin, rinsed with water and mounted between 2 glass microscope slides

AGE INTERPRETATION DIFFICULTIES

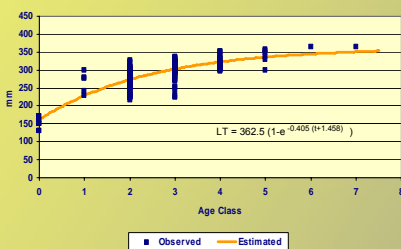
Otoliths (n=1 873) → 51% Rejected
Scales (n=1 162) → 41% Rejected



Reading Reliability

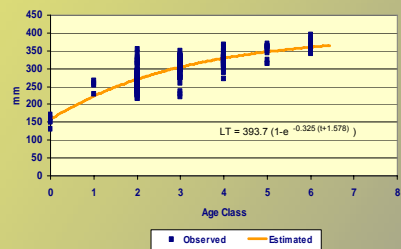


S. aurita - Growth Males



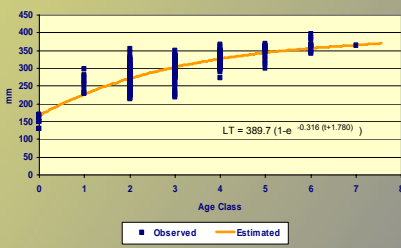
Legend: ■ Observed, — Estimated

S. aurita - Growth Females

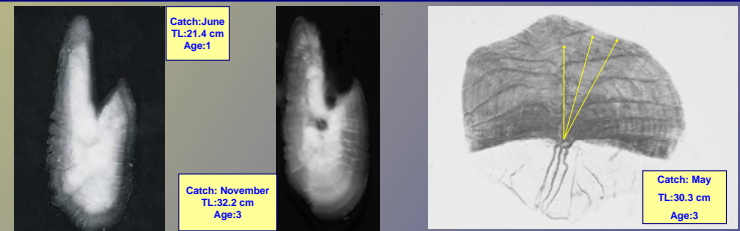


Legend: ■ Observed, — Estimated

S. aurita - Growth All Individuals



Legend: ■ Observed, — Estimated



OTOLITHS / SCALES READING RESULTS

- The percentage of agreement between both otoliths and scales was 87.2 % (CV=7.1 %)
- Agreement Age-Otolith in relation to the final age: 98.9 %
- Agreement Age-Scale in relation to the final age: 75.4 %

Otoliths seem to be the more reliable structure.

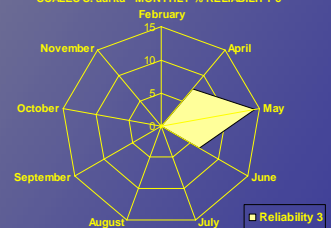
However, in some months (April-June) scales are very useful due to the better observation of the new growth zone on the edge

Growth Parameters of S. aurita of the NW Africa (in Tskirikas et al., 2005)

AREA	K	L _∞	t ₀	REFERENCE
Canary Islands	0.308	34.61	-0.631	Navarro, 1932
Mauritania	0.326	40.70	-0.628	Pham-Thuc and Szypula, 1973
Mauritania	0.381	41.63	-0.871	Onsheva, 1998
Senegal/Mauritania	0.364	45.22	-0.691	Maxim and Maxim, 1987
Senegal	0.306	30.63	-0.862	Botly et al., 1982
Senegal	0.274	40.69	-0.991	Krczapkowski, 1981
Senegal	0.303	43.18	-0.856	Krczapkowski, 1981
Senegal	0.283	42.12	-0.938	Krczapkowski, 1981
Congo	0.886	31.00	-	Rossignol, 1955
Congo to Southern Angola ⁽¹⁾	1.023	25.97	-0.08	FAO, 1979
Congo to Southern Angola ⁽²⁾	1.210	26.00	-0.32	FAO, 1979

(1) 8th May 1st January
(2) 8th May 1st May

SCALES S. aurita - MONTHLY % RELIABILITY 3



DISCUSSION

- The annual growth parameters estimated in this study: values of K generally similar to other authors for *S. aurita* of North West Africa, and values for L_∞ very near to the real ones, seem to show a coherent pattern of interpretation
- However, the number of specimens smaller than 20 cm TL in this study was very low. It would be necessary to confirm these results increasing the number of juveniles (age class 0 and 1) in later studies

RECOMMENDATION

- In the case of the *S. aurita* it is very useful to read the scales and compare the results, the advantage being the use of the otolith for help and comparison in age reading, but the disadvantage being the arduousness of this work and of course, how much time-consuming the biological sampling is.
- For this species it is recommended to extract and prepare at least 20 - 40 otoliths for each cm to allow for the rejection of those that do not show the growth zones clearly.

REFERENCES

- FAO, 2007. Report of the Workshop on the age estimation of sardine and sardinella in Northwest Africa. Casablanca, Morocco. 4-9 December 2006. FAO Fisheries Report No. 848: 107 pp.
- Tskirikas, A.C., E.T. Koutrakis and K.I. Stergiou. 2005. Age and growth of round sardinella (*Sardinella aurita*) in the northeastern Mediterranean. *Scientia Marina*: 231-240.