Age Calibration Exercise Analysis for Anchovy in Division 9a (IBERAS survey 2018)

IEO-IPMA Readers

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Background and Objetives

✓ In November 2018, a **new acoustic survey (IBERAS)** coordinated by IEO and IPMA was carried out **in order to estimate the strength of sardine and anchovy recruitment in the Atlantic waters of the Iberian Peninsula (ICES Division 9a)** and to map its distribution area. As well as determine the main biological characteristics of these species in the area.

✓**Intercalibration exercises by areas** (for the different countries taking part in otolith age reading on the same stocks or adjacent stocks) are **required by the last Anchovy workshop and Exchange** (ICES 2017; Villamor et al. 2019)

✓In January-February 2019, **an otolith reading exercise** was carried out on the anchovy from the survey to determine its age, **with the objective of calibrating the age readings among the anchovy readers of the IEO and the IPMA**, and estimating the accuracy and discrepancies in the determination of anchovy age among these readers in this area. As well as, to obtain the age length keys of the survey.
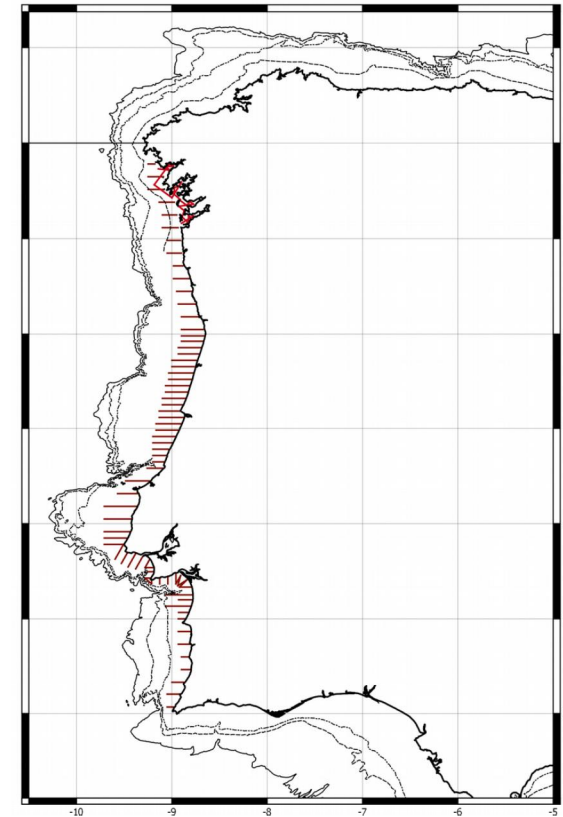
Exchange Procedure

✓Samples analysed :

➢ A set the **334 otoliths** (not images) of anchovy distributed in Atlantic waters of Iberian Peninsula (ICES Division 9a) from the IBERAS 2018 survey were reading and analyzed.

➢ For the analysis of the results, AGE COMPARISON excel workbook (Eltink, 2000) has been used and the analysis has been made for the whole area, since the number of otoliths in the Subdivision 9a CS was very small.

Division 9a	Number of Otoliths	Size range	Month
Central-South (9a- CS)	30	100-162 mm	November
Central North (9a-CN)	304	107-183 mm	November
Whole area	334	100-183 mm	November
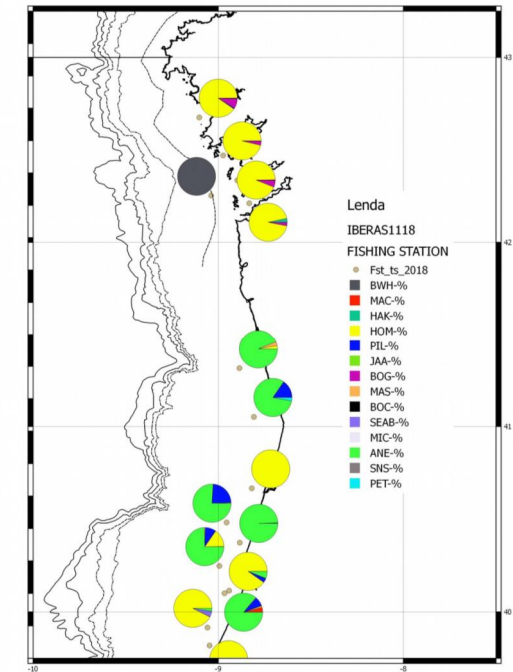
✓Number of participants involved in the age reading:

➢ A total of **3 readers** were involved in the present Calibration of anchovy, two of them from IEO (Experts readers) and the third from IPMA (intermediate reader).

➢ The three readers participated in the last International Exchange of 2018, but nevertheless the reader of the IPMA did not participate in the last workshop of 2016 (ICES WKARA2), where the current criteria for determining the age of the anchovy were standardized and implemented.

✓Numbers of participants delivering data for "assessment": **2 readers** (1 expert from IEO and 1 intermediate from IPMA).

Results: PA, CV and BIAS

✓The weighted average percentage agreement (PA) based on modal ages for all readers and samples are 93.4 %, with the weighted average CV of 8.4 %.

✓Most of the anchovy otoliths were well classified by the readers during the 2019 calibration, with a good agreement and precision.

✓267 out of the 334 otoliths reached 100% of agreement

✓The best agreements are reached for age 0 (91%) and age 1 (95.8%), and the lowest agreement for age 2 (75%). No individuals over 2 years of age were assigned in the sample.

✓Another fact is that there are no signal biases of each reader with the modal age and neither between them, which means that they have a good precision in the determination of the age of the anchovy in the studied area

Modal Age	Otolith N	CV	% Agreement	Bias
0	70		91.9%	0.08
1	236	5.9%	95.8%	0.03
2	26	25.8%	75.0%	-0.25
3		-	-	-
4		-	-	-
5		-	-	-
Total	**332**	**8.4%**	**93.4%**	**0.02**

	CD	ES	AA
	Reader 1	**Reader 2**	Reader 3
Reader 1	95.8	-	-
Reader 2	81.8	86.2	-
Reader 3	94.0	84.3	97.9

MODAL age	-	-	-

-	= no sign of bias (p>0.05)
*	= possibility of bias (0.01<p<0.05)
* *	= certainty of bias (p<0.01)
	= percentage of reading agreement between each reader and the MODAL age

Conclusions

✓In general, it can be said that in view of the results (high agreements, low CV and without biases) of this Calibration **the three readers apply well the current age determination criteria updated in the last workshop of the anchovy age** (ICES WKARA2, 2016).

✓Taking as reference the Bay of Biscay anchovy where several workshops and exchanges have regularly taken place (since 1989) (and age validations are achieved), WKARA2 suggested threshold values of agreements around 80% and of CVs around 20% in the training process as a minimum for age readers to be operative to deliver inputs for assessment. And targets should be for agreements above 90% and CV of 10% or less. **The results of this Calibration among of these readers are in the levels of the objectives of agreement and CV suggested by WKARA2**.

✓The three readers have achieved **higher agreements and lower CVs in this Calibration than in the last International Exchange of anchovy in the Bay of Biscay in 2018** (Villamor et al., 2019), **especially noted the improvement of the IPMA reader**. In 2018 Exchange, the two readers of the IEO had a PA above 90% (91 and 92% respectively with the modal age) and a CV of 15% and the IPMA reader had a PA of 76% and CV 21%.

✓If we **compare this Calibration with the results of the 2014 international exchange of the anchovy from the same area (Division 9a), we see that the improvement is great for the three readers** (in 2014, PA between 45 and 71% and CV between 34 and 37% with respect to modal age) (Villamor et al., 2015).

Conclusions

✓The **biggest discrepancies found in this Calibration were in age 2**. This is mainly due to the fact that in some cases the false spawn ring that deposits the anchovy in summer is confused with the annual winter ring.
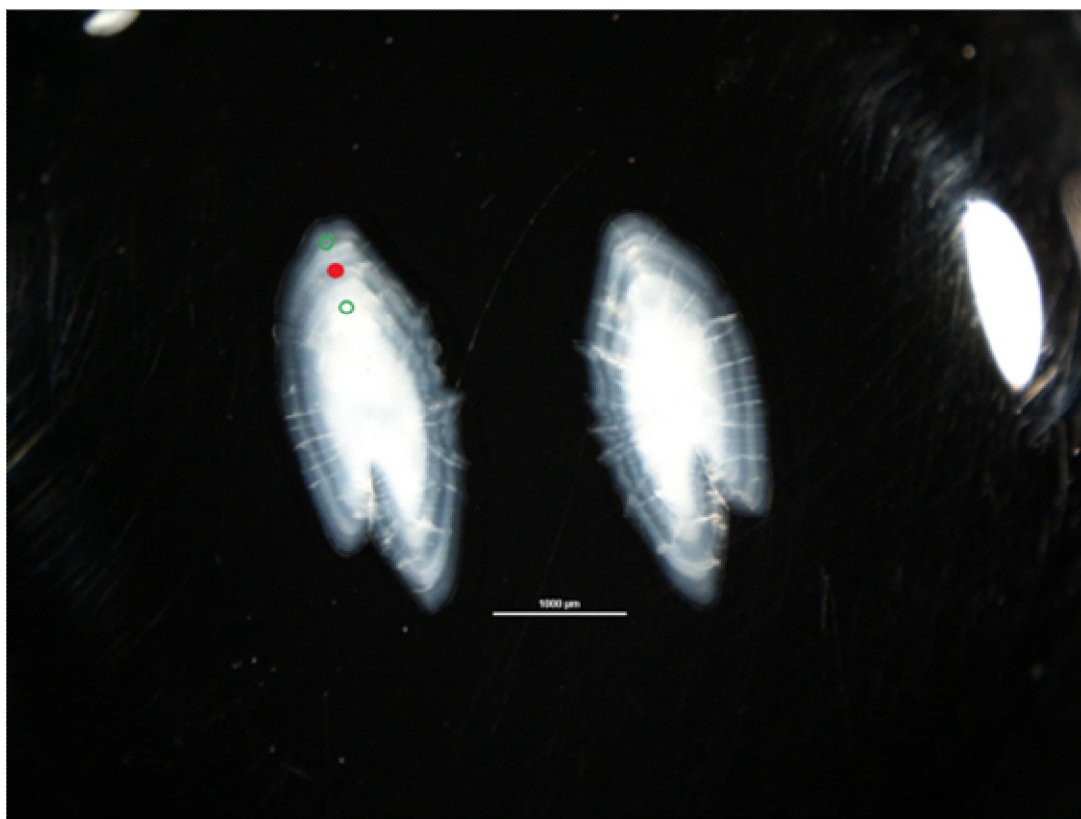
Age Reading for anchovy AP.17.nº 22, **14.1 cm, caught November 2018. 67% agreement: Age 1 (IEO readers ages 1; IPMA reader age 2). Conventional birthdates: 1st January.**

This otolith illustrates that a bad recognition of the typical growth pattern and of checks leads to over estimation of the actual age (resulting in that case in a less intense growth pattern than expected in particular during the second year of life –as age 1)

Recommendations for future work

✓It is recommended to continue and follow the protocols and criteria for the interpretation of anchovy age in all areas proposed in WKARA-2.

✓We recommend the readers to review and read the WKARA2 report (where there are many examples) and to review the collection of otoliths of reference which is in the Age Reader's Forum website (https://community.ices.dk/ExternalSites/arf/default.aspx) in the folder called 'Engraulis encrasicolus Otolith Reference Collection'

✓In IPMA, there are two new anchovy readers who have not participated in this calibration, since they still need a period of training, and for this a workshop will be included in November 2019 in the IEO of Santander.

✓All anchovy readers of the two institutes should participate in future exchanges and workshops of the anchovy age

Thank you for your kindly attention!