

OTOLITH AGE DETERMINATION WORKSHOP: SUMMARY

IMROP

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The methods we have covered in this workshop

We have covered several main types of otolith processing including practical lab training

We have looked at how to age otoliths and identify growth rings.

This takes a lot of practice, the best way to train and check your work, is to:

1. Work with other labs who have aged these species,
2. Get multiple people to age the same specimens and compare ages.
3. Conduct a validation study using daily rings.

The best way to compare rings between readers is to either use the microscope camera so two people can age the same sample. Or image the samples and use the R script we discussed to compare ages.

The methods we have covered in this workshop

Whole otolith reading:

The simplest method – viewing otoliths whole using either transmitted or reflected light

Whole otolith embedding:

This method can be much more precise and is good for daily growth bands.

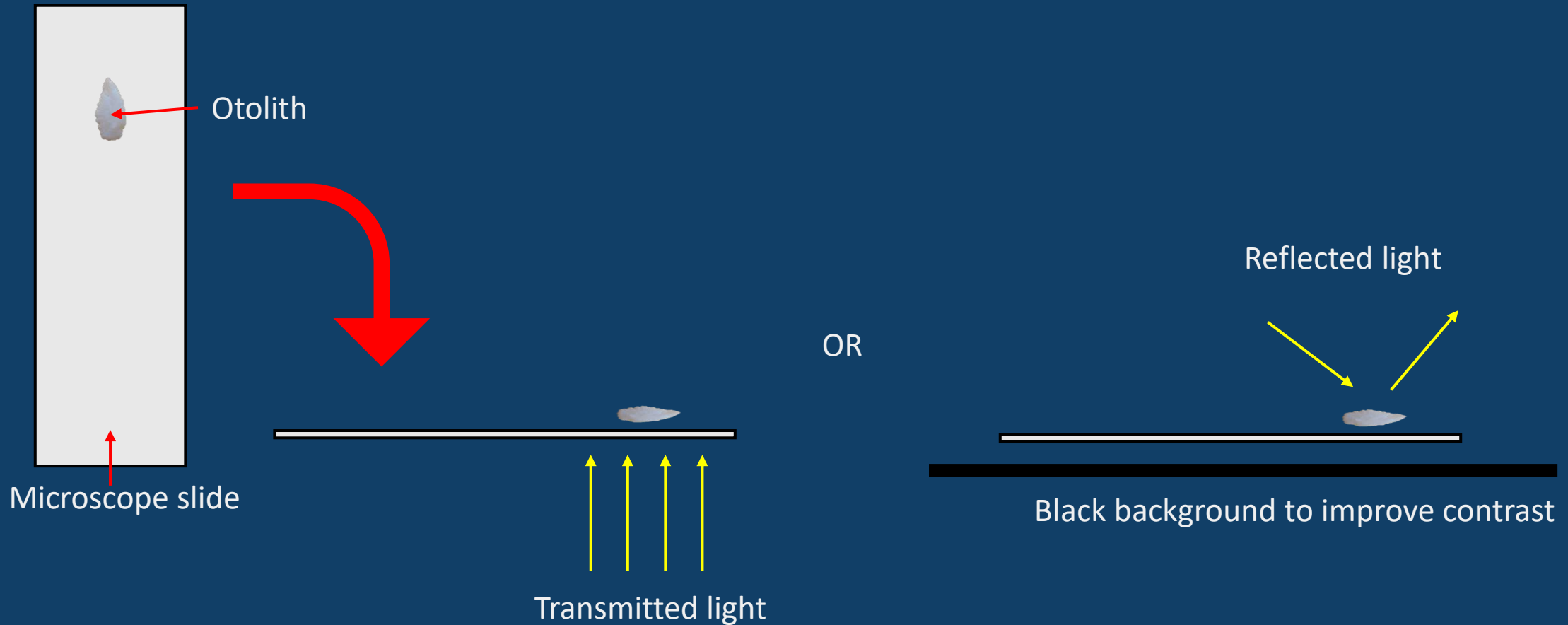
It can be quick if otoliths can be viewed whole, but if they need to be ground and polished, it is the most time-consuming approach.

Thin sectioning:

This method is good for processing multiple samples at once, but has several steps of embedding and mounting.

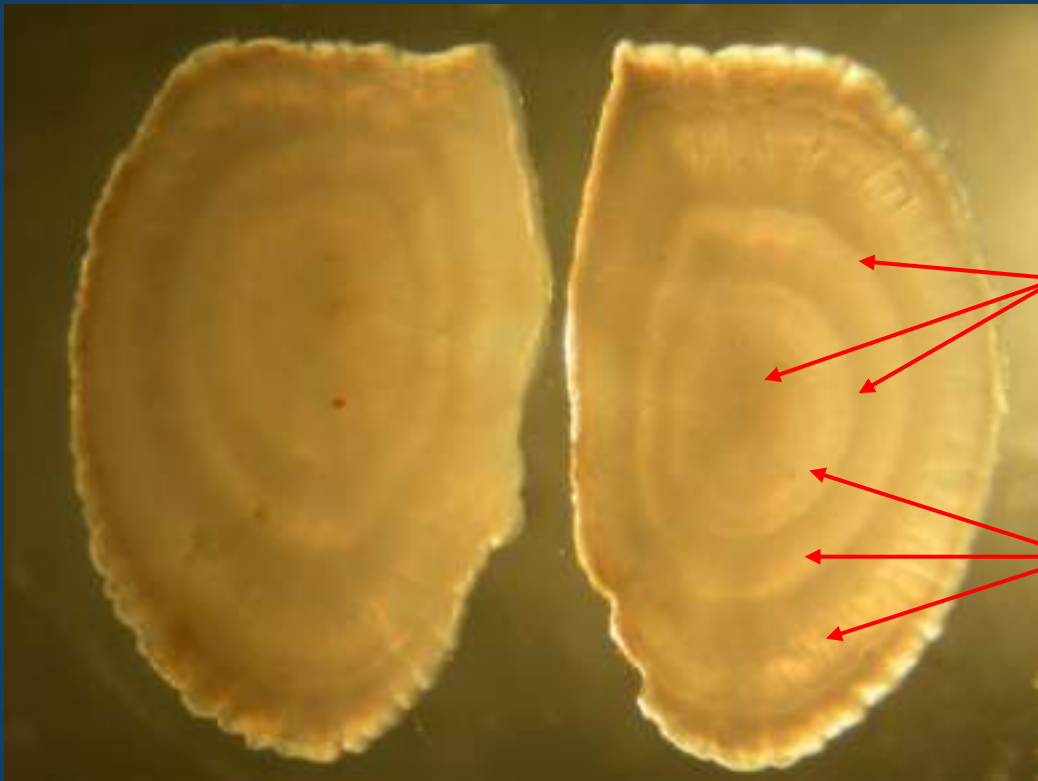
Whole otolith reading

For this method, the aim is to look at growth lines in whole otoliths with no embedding.

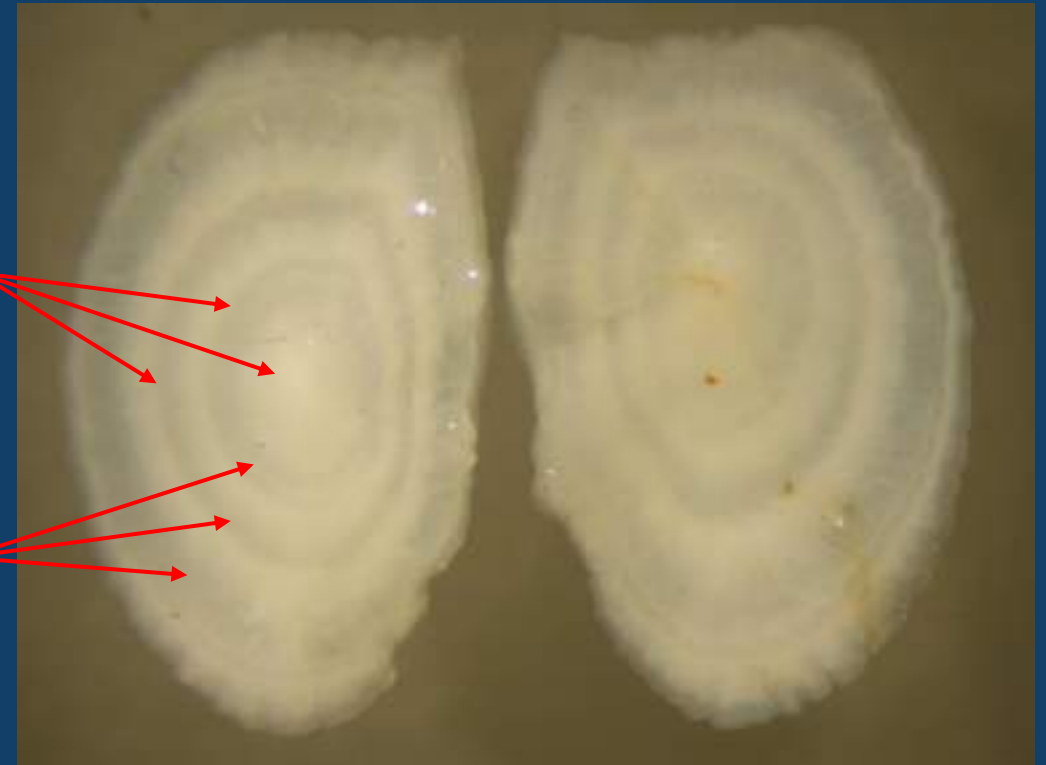


Whole otolith reading

Opaque and hyaline zones look different depending on what type of light you use.



Transmitted light



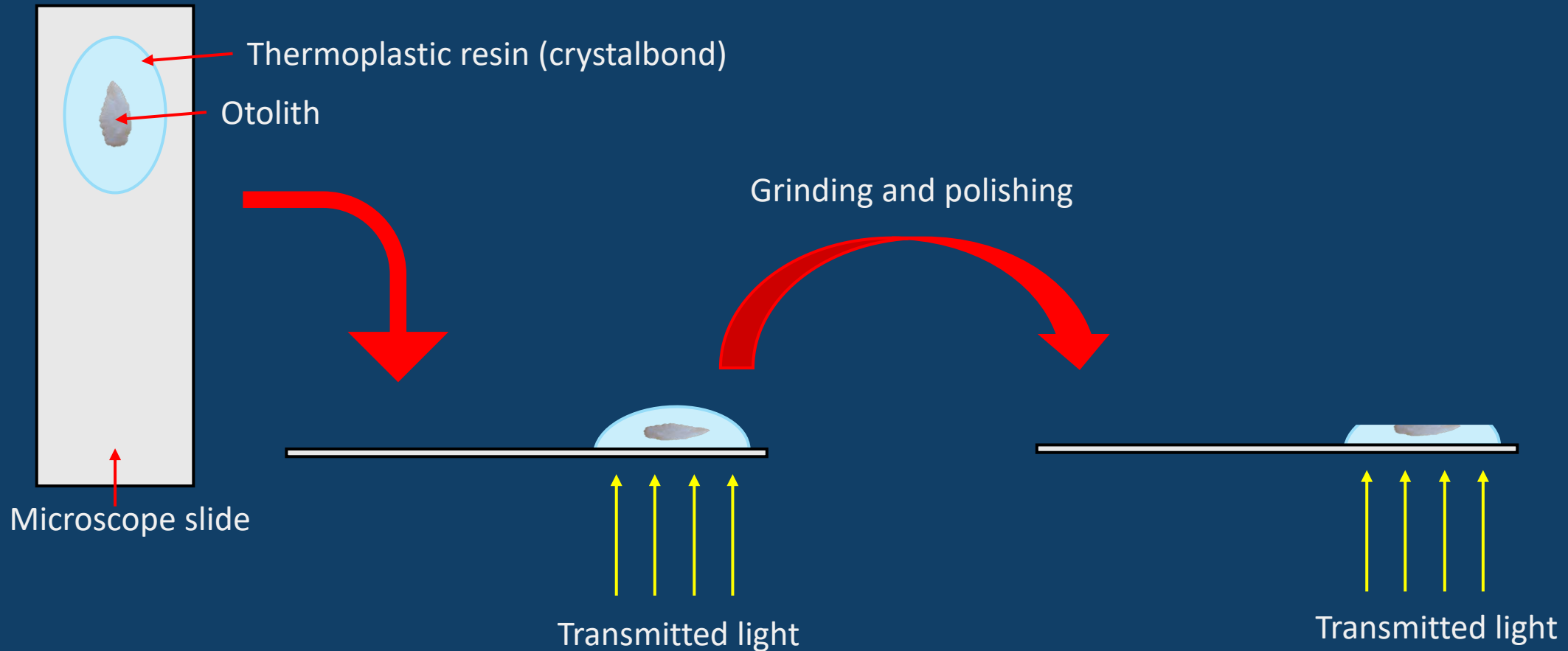
Reflected light

Opaque zones

Hyaline zones

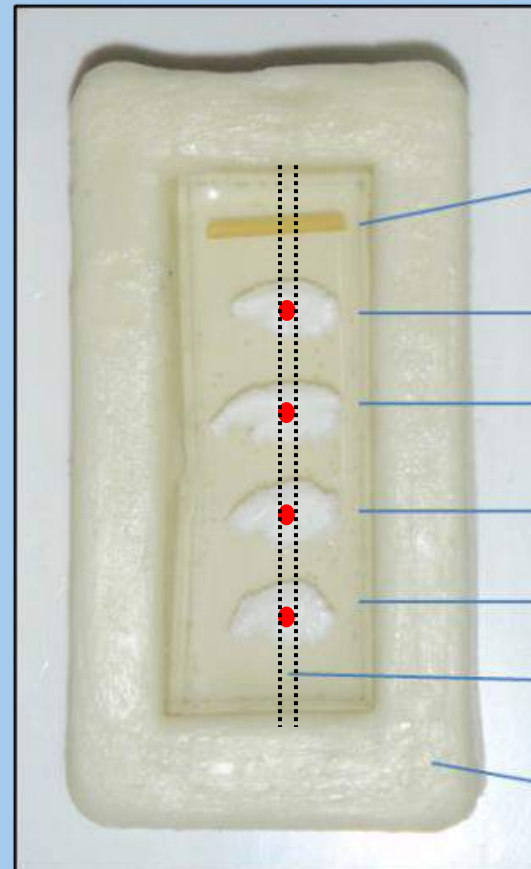
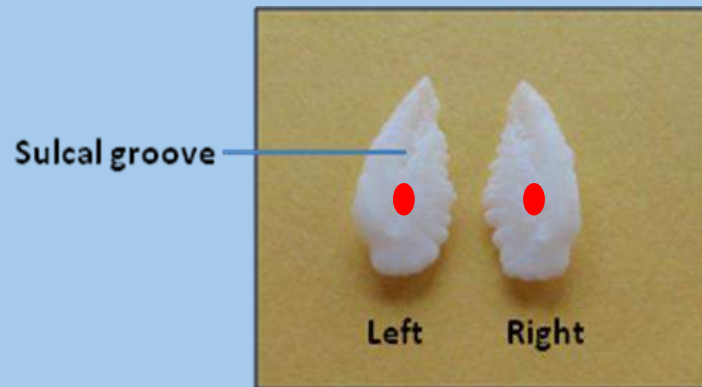
Whole otolith embedding

For this method, the aim is to look at a single otolith, either whole or ground and polished to expose the internal structure.



Thin sectioning

For this method, the aim is to cut thin slices from otoliths to look at the internal structure using transmitted light.



Spaghetti marker

Otolith A1 - 1

Otolith A1 - 2

Otolith A1 - 3

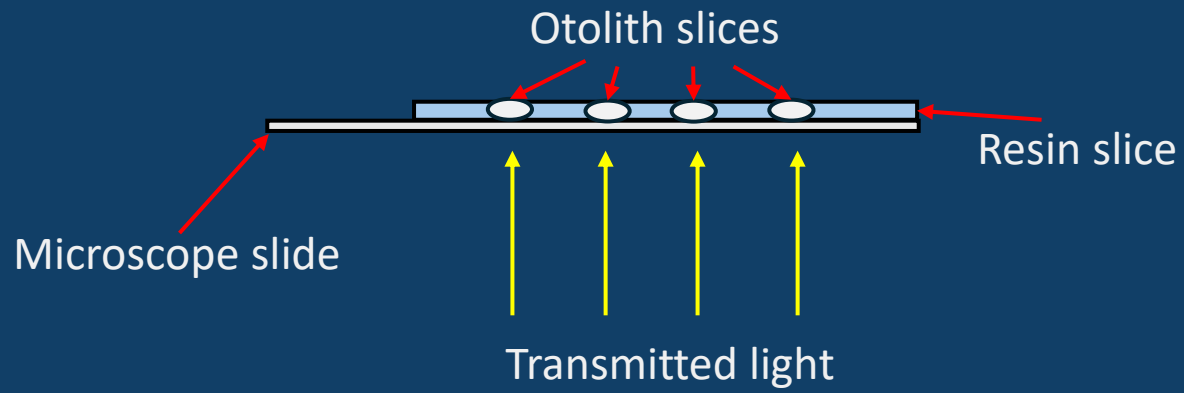
Otolith A1 - 4

Epoxy resin

Silicone rubber
mould



Thin sectioning



Age reading

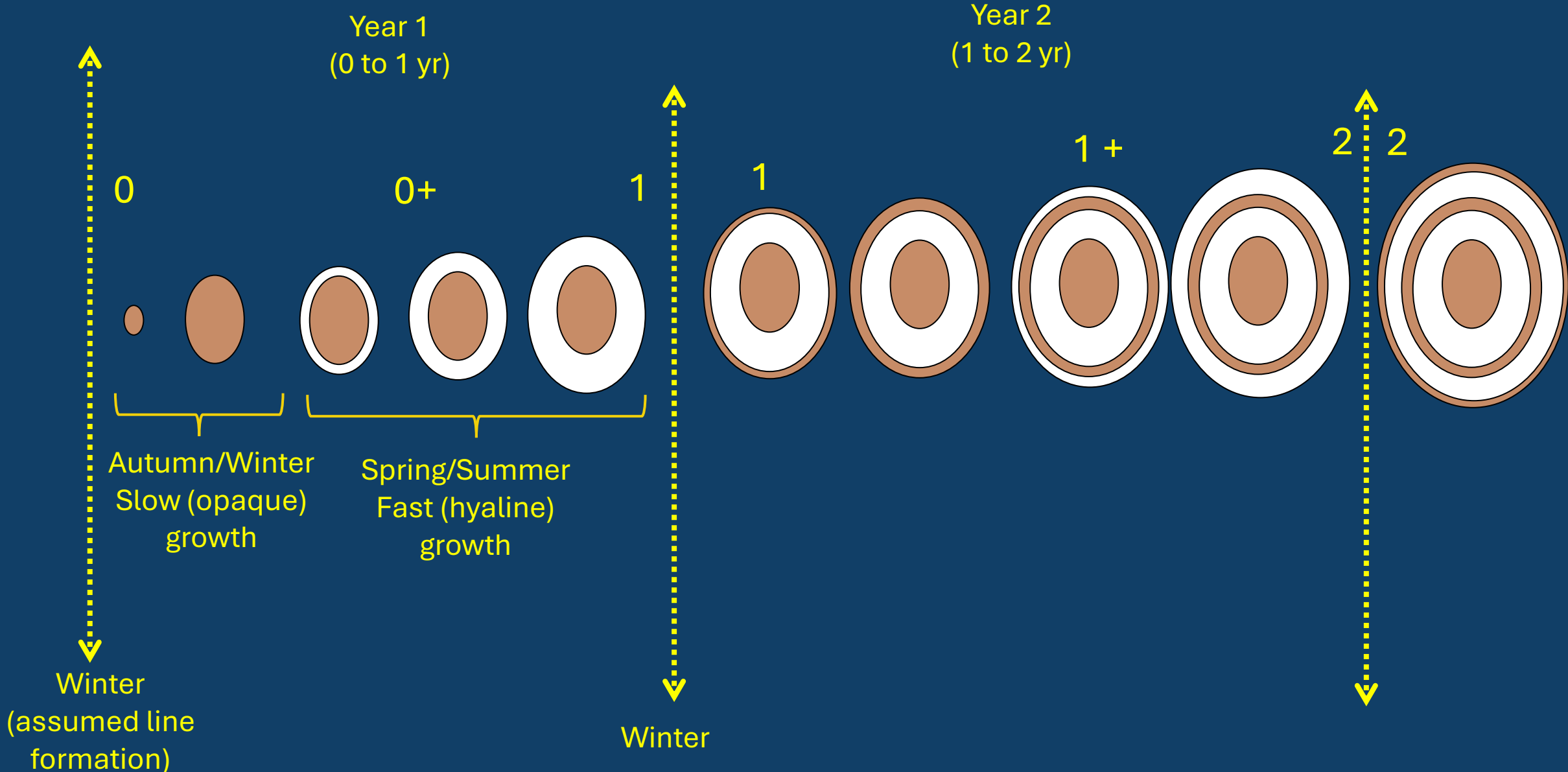
This is a difficult task for the small pelagic fish, their fast growth and high mobility make their otoliths hard to read.

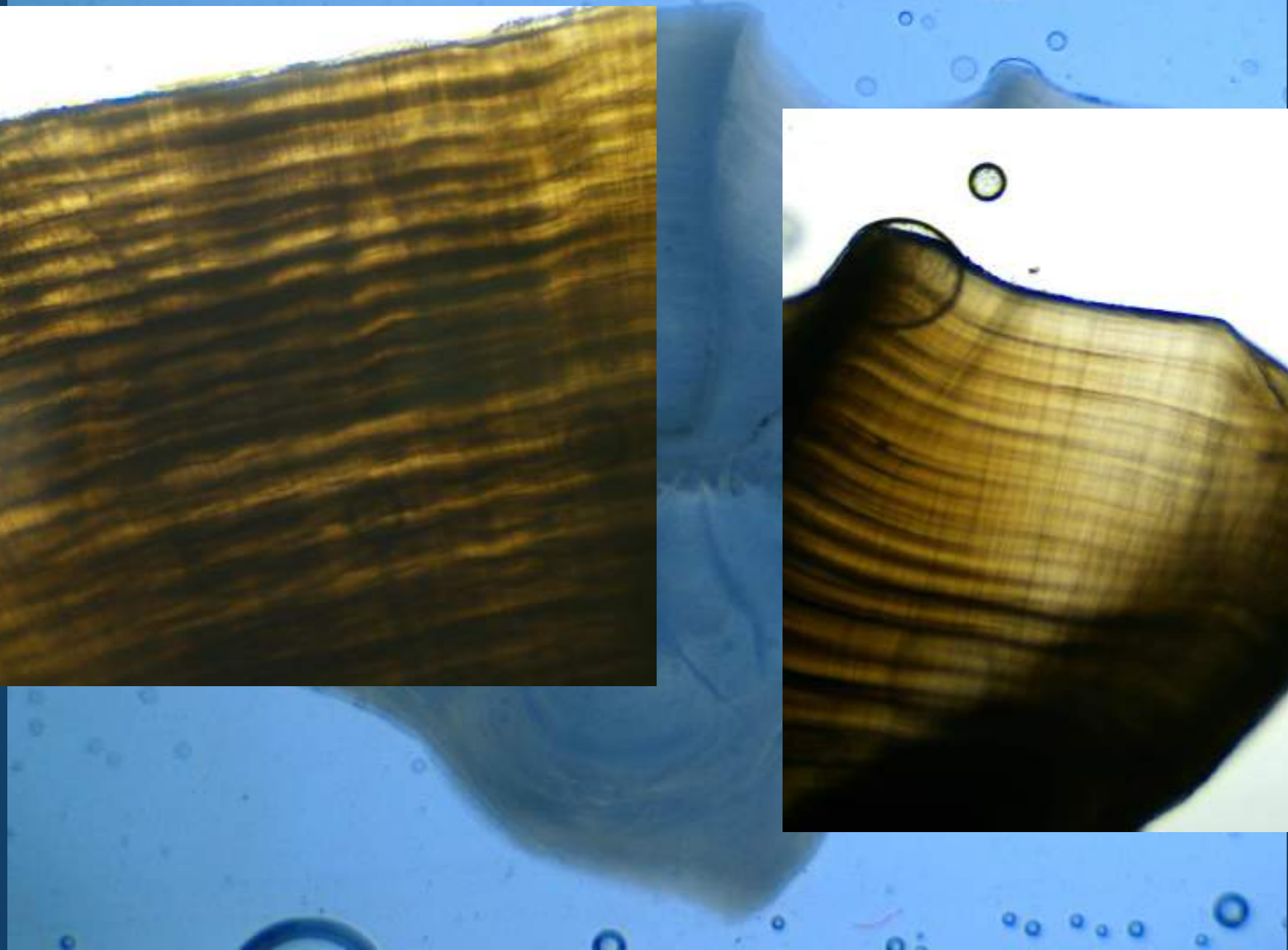
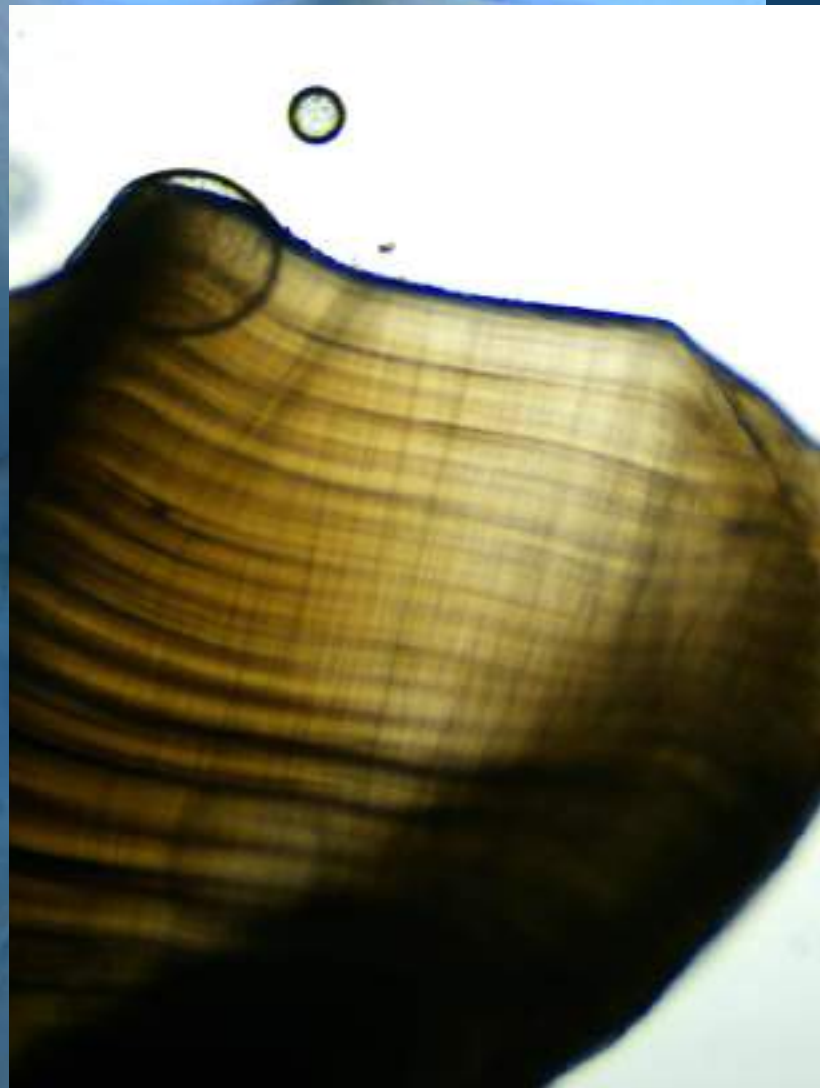
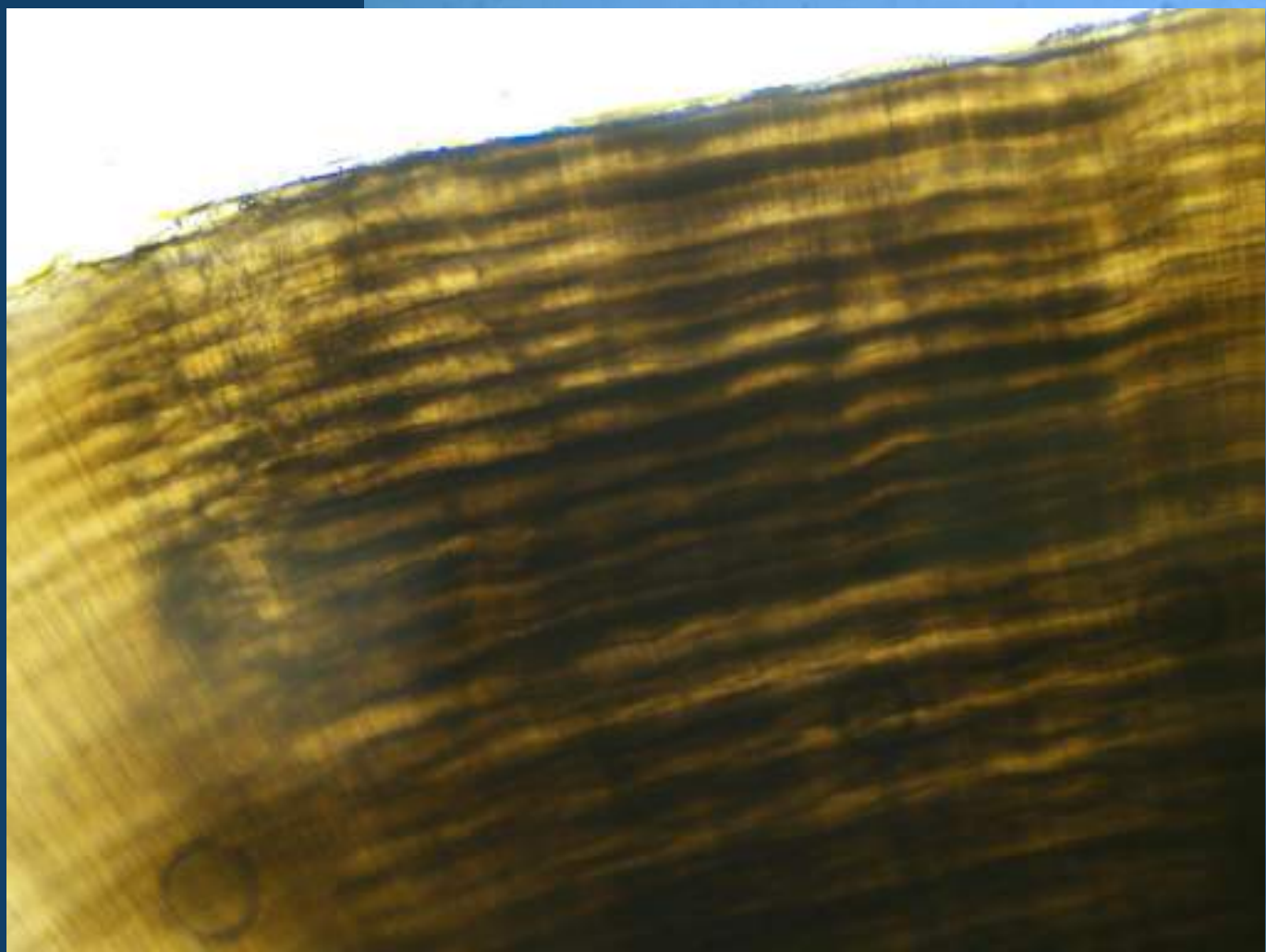
We have talked about how to identify growth rings (annual and daily) and why understanding the ecology of the fish and when it was captured is so important.

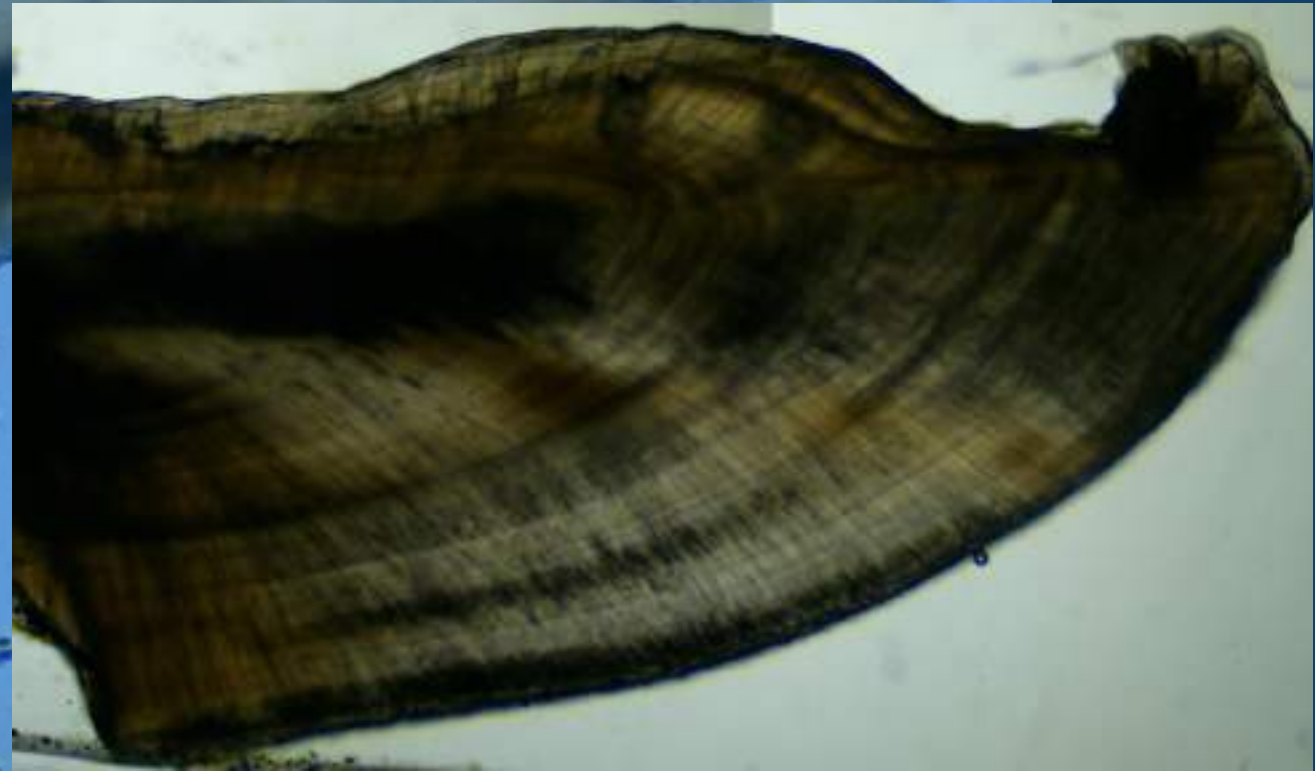
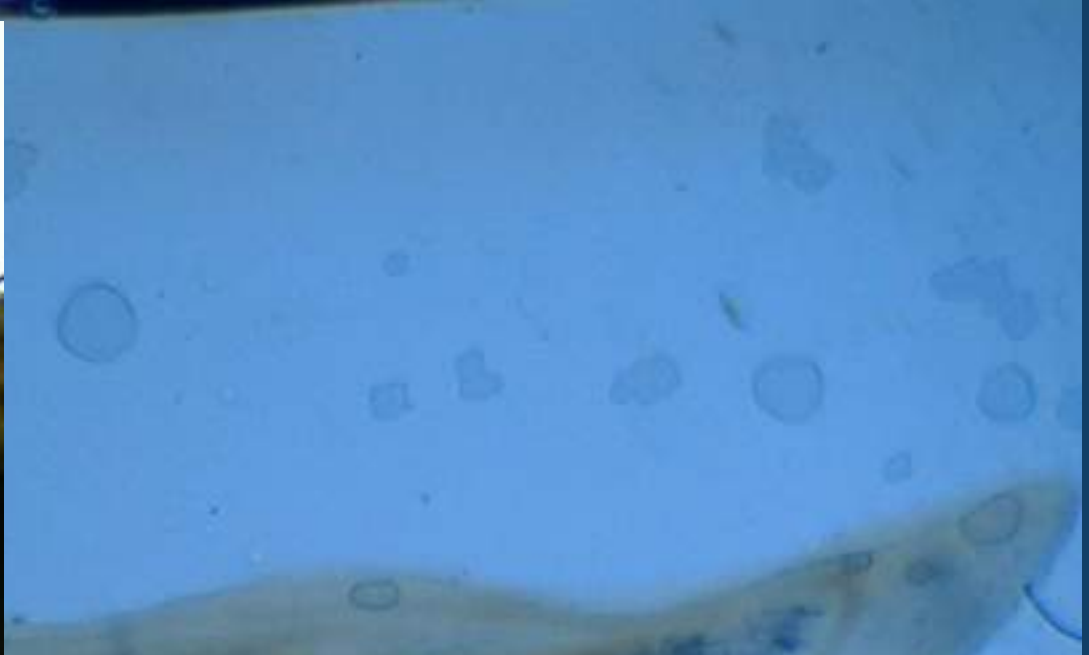
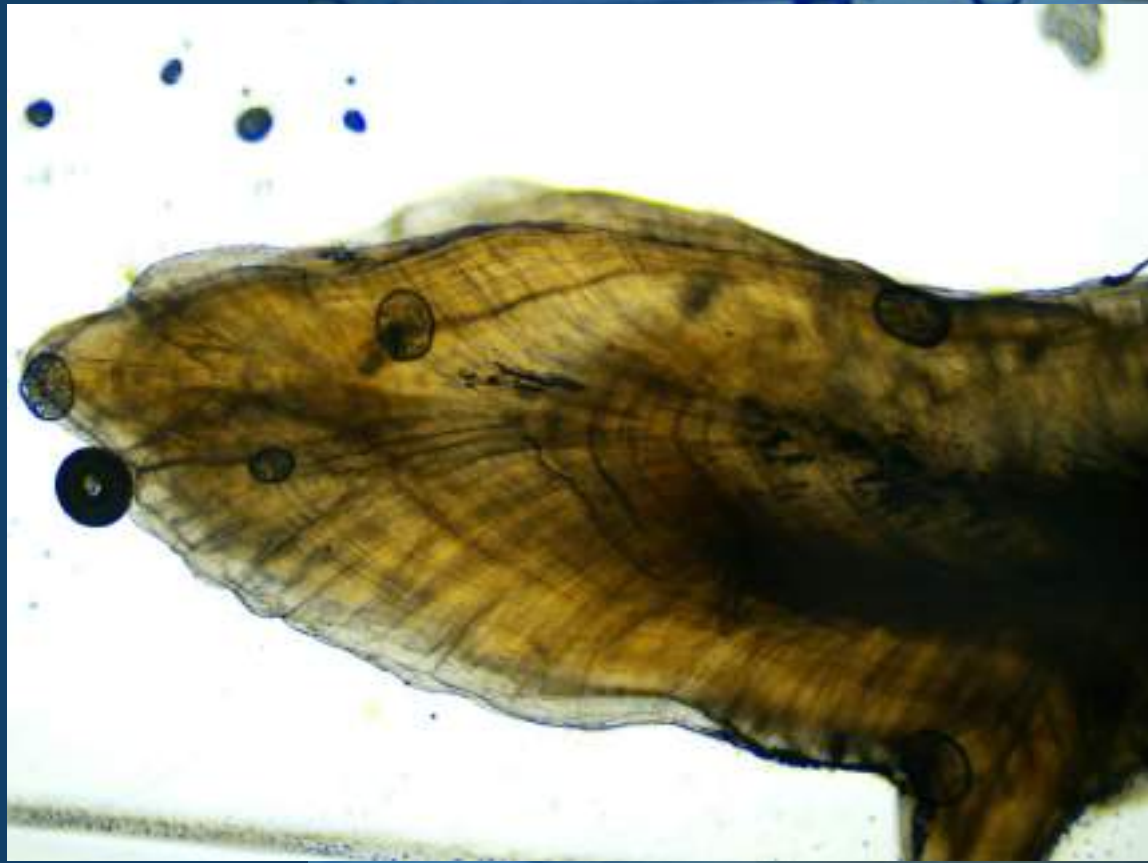
If you caught the fish in winter, will it have a full growth ring at the edge of the otolith?

What about in the summer?

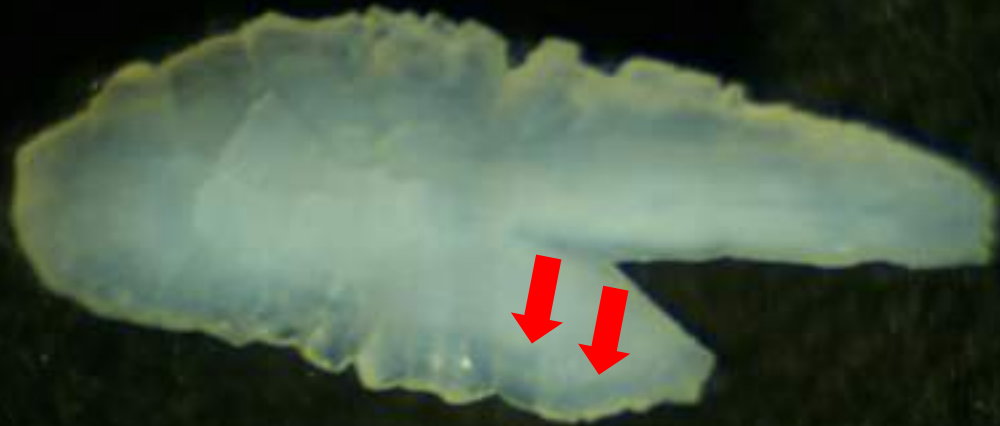
Age reading in an ideal world!



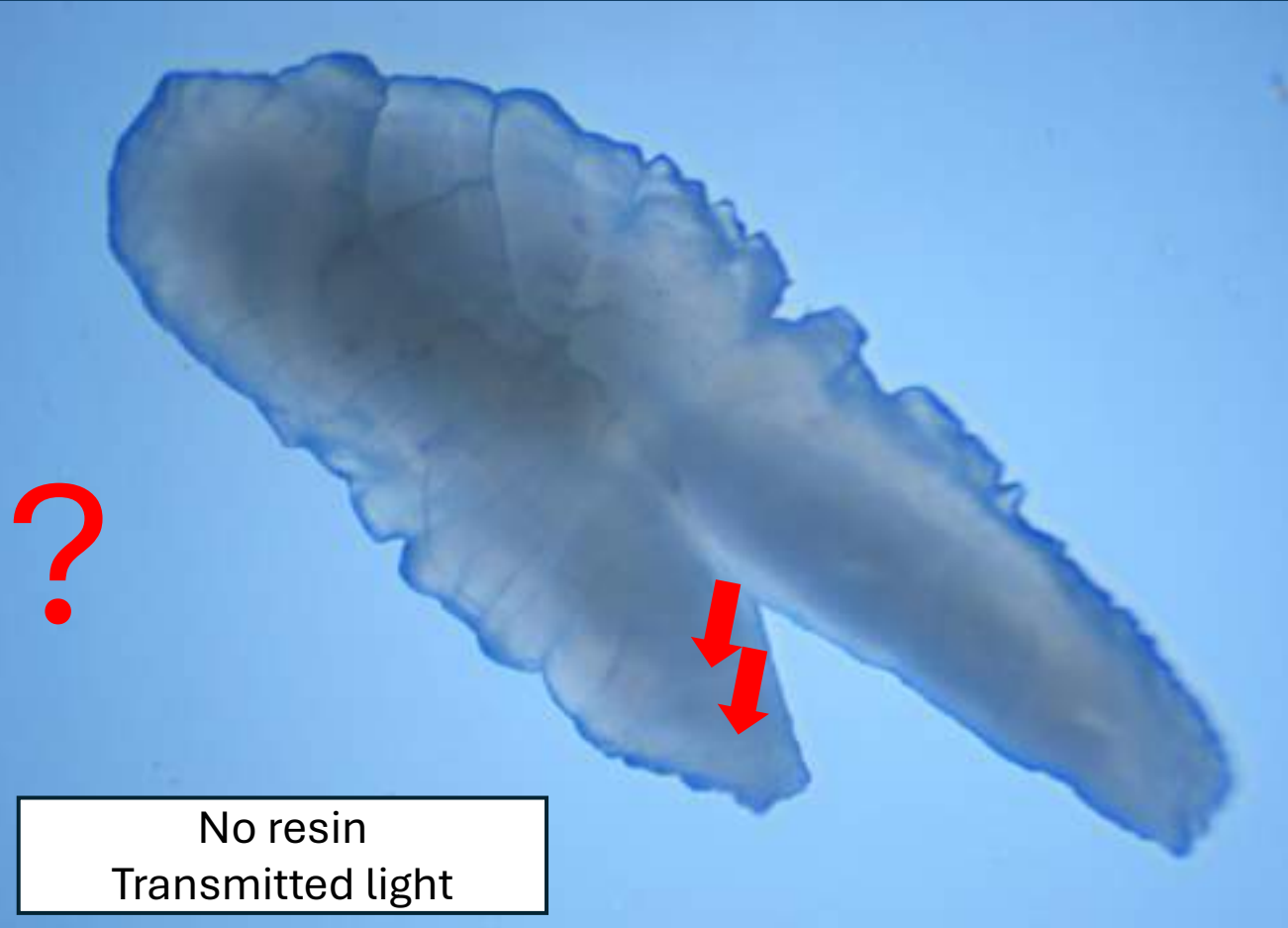




Sardinella aurita

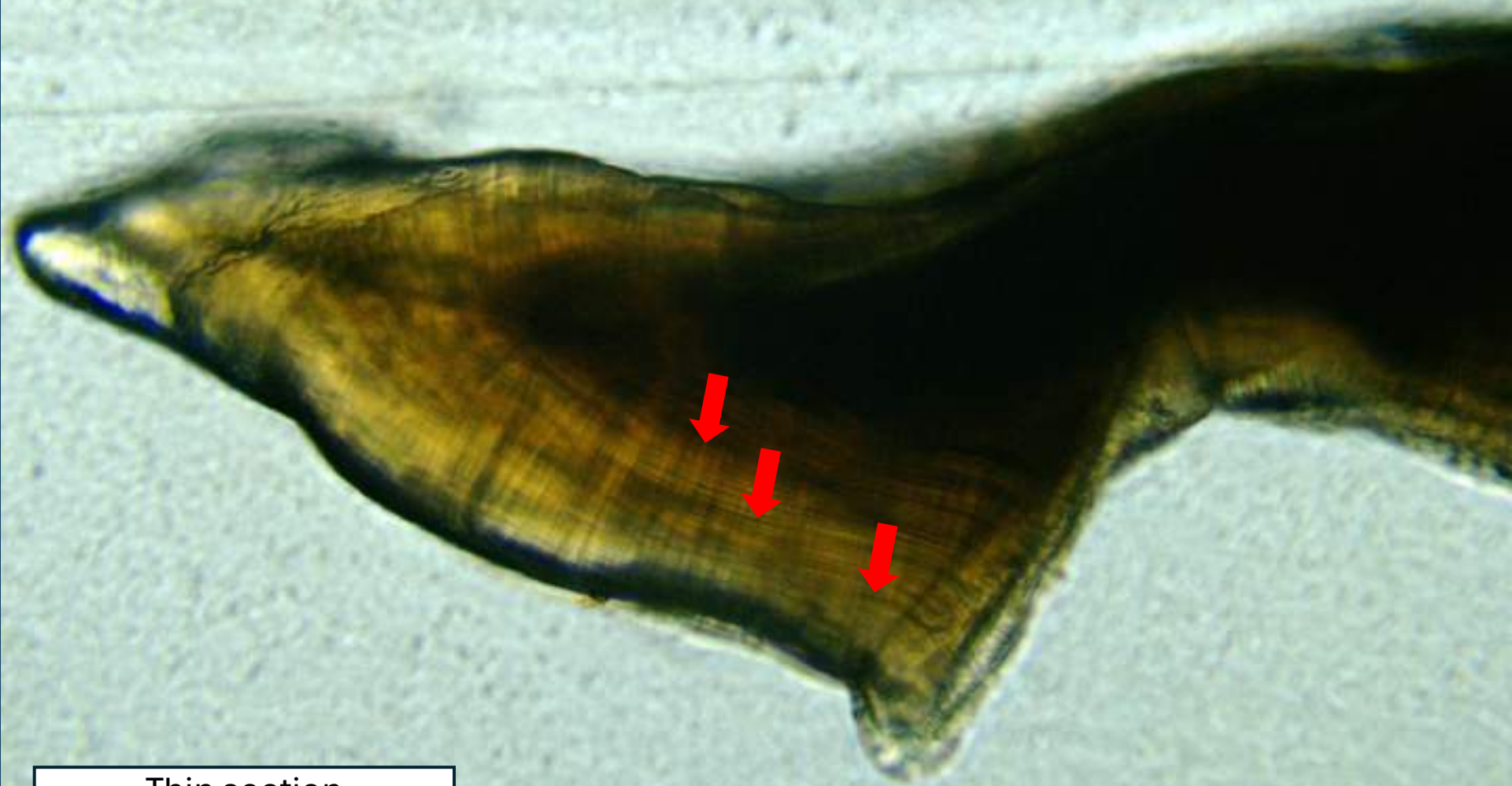


No resin
Reflected light

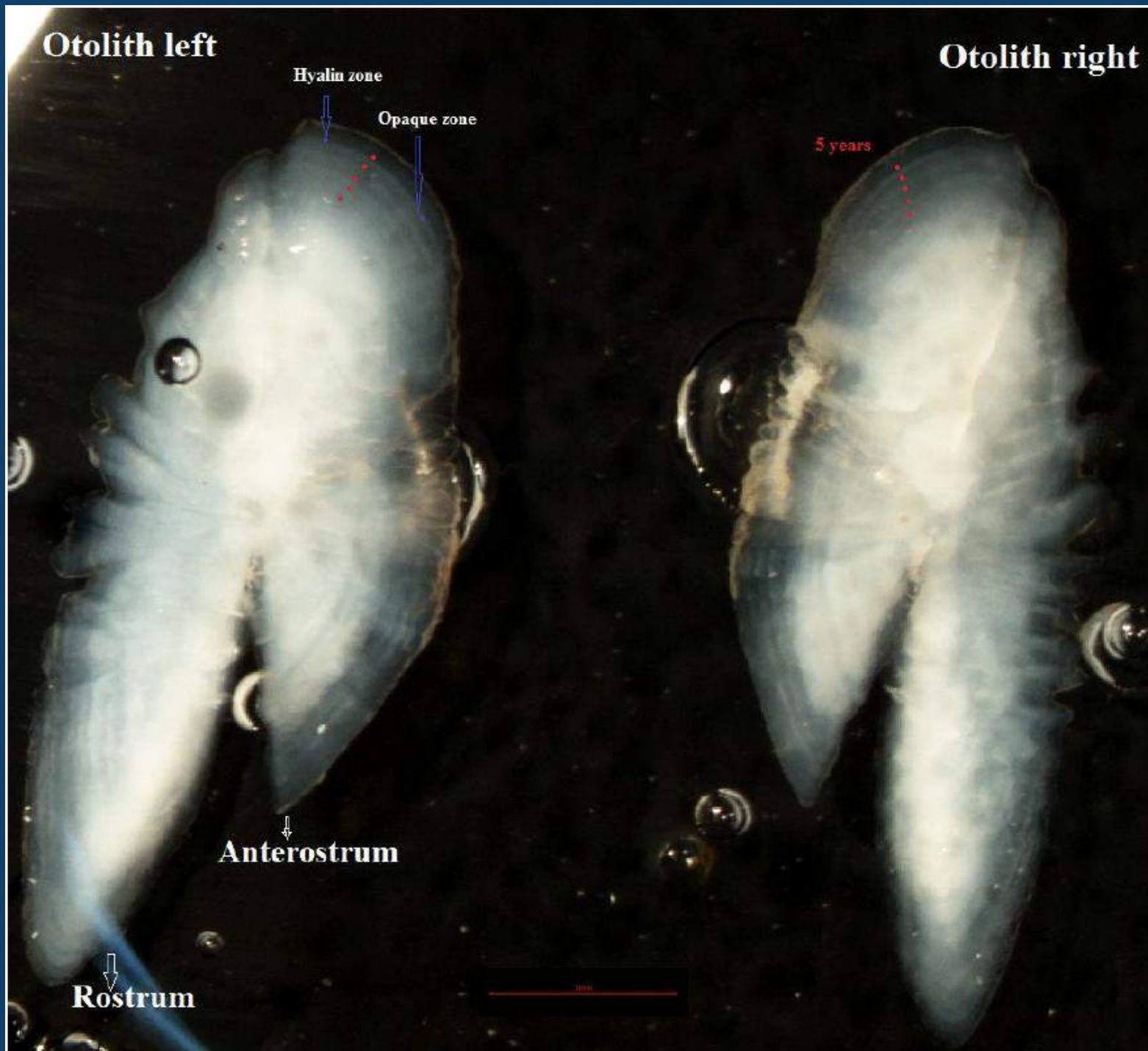


No resin
Transmitted light

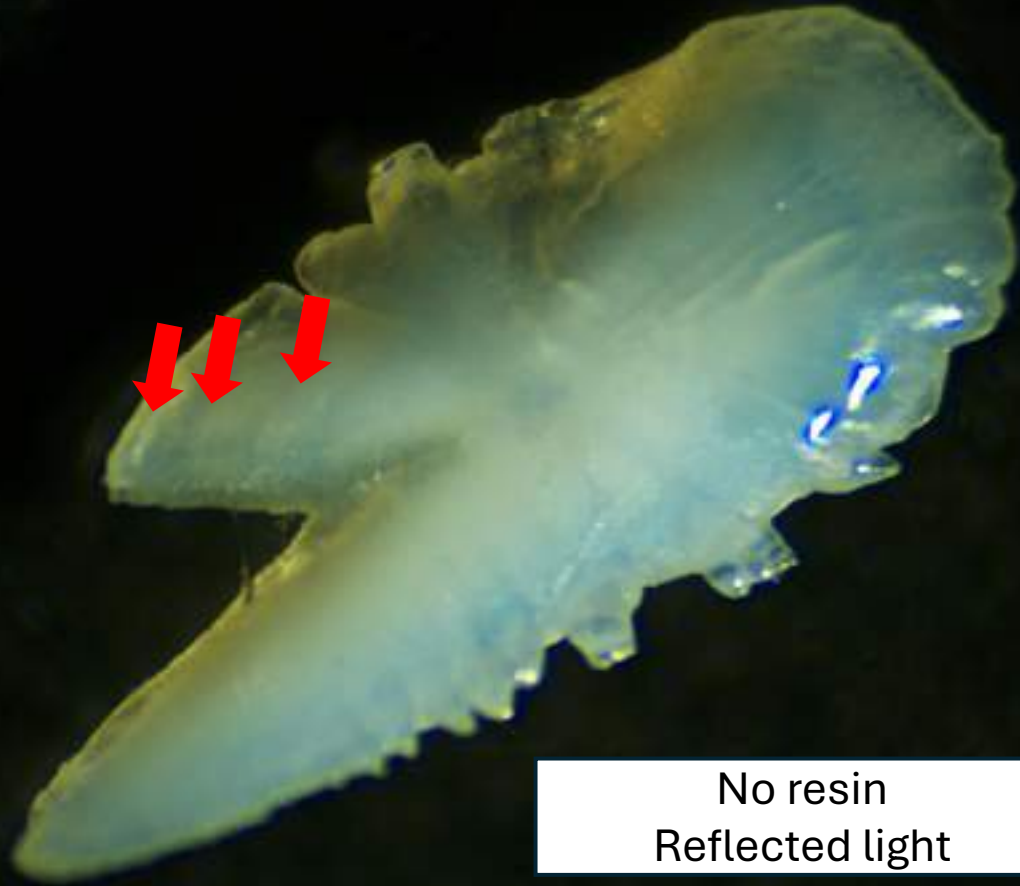
*Sardinella
aurita*



Thin section
X4 magnification



Sardinella maderensis

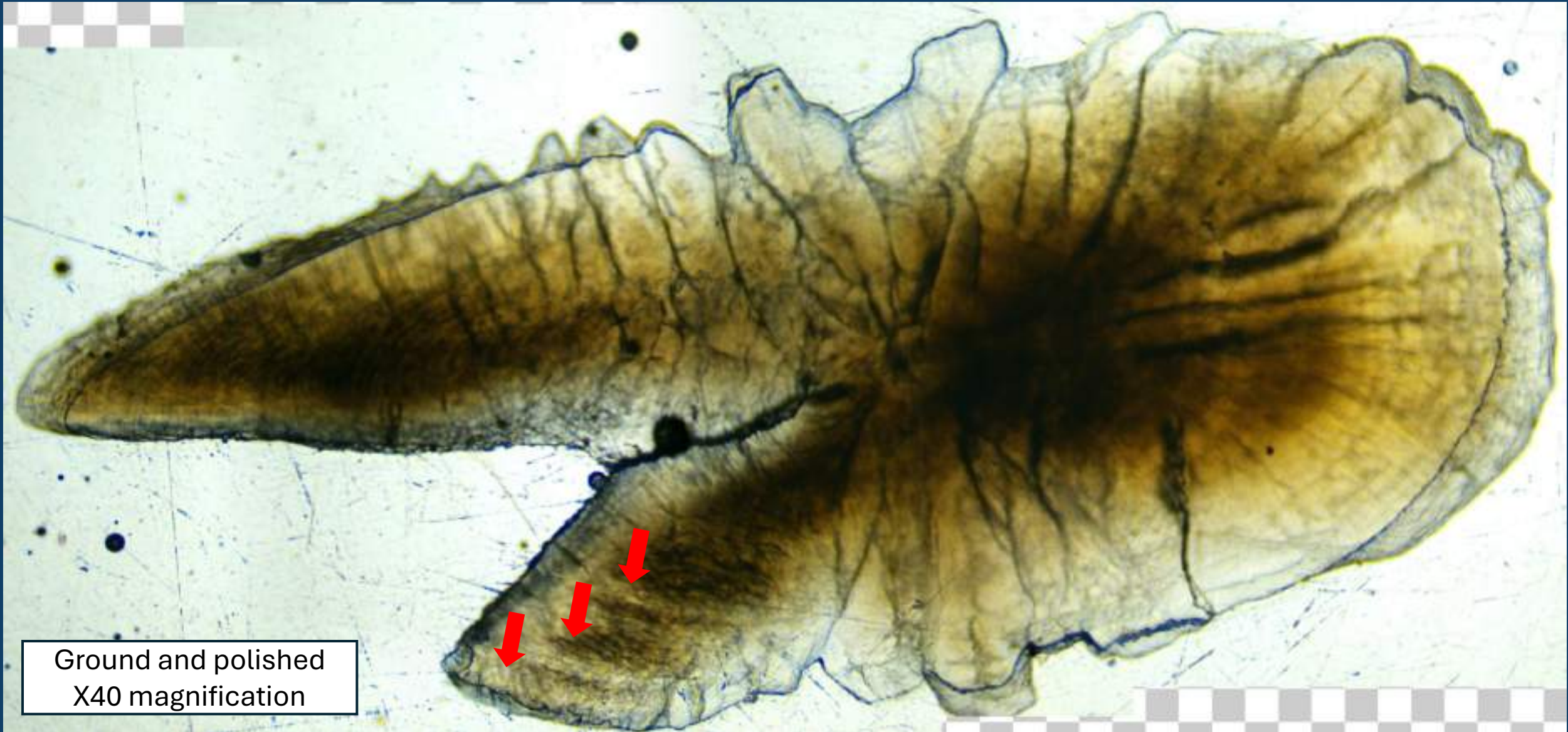


No resin
Reflected light



No resin
Transmitted light

Sardinella maderensis

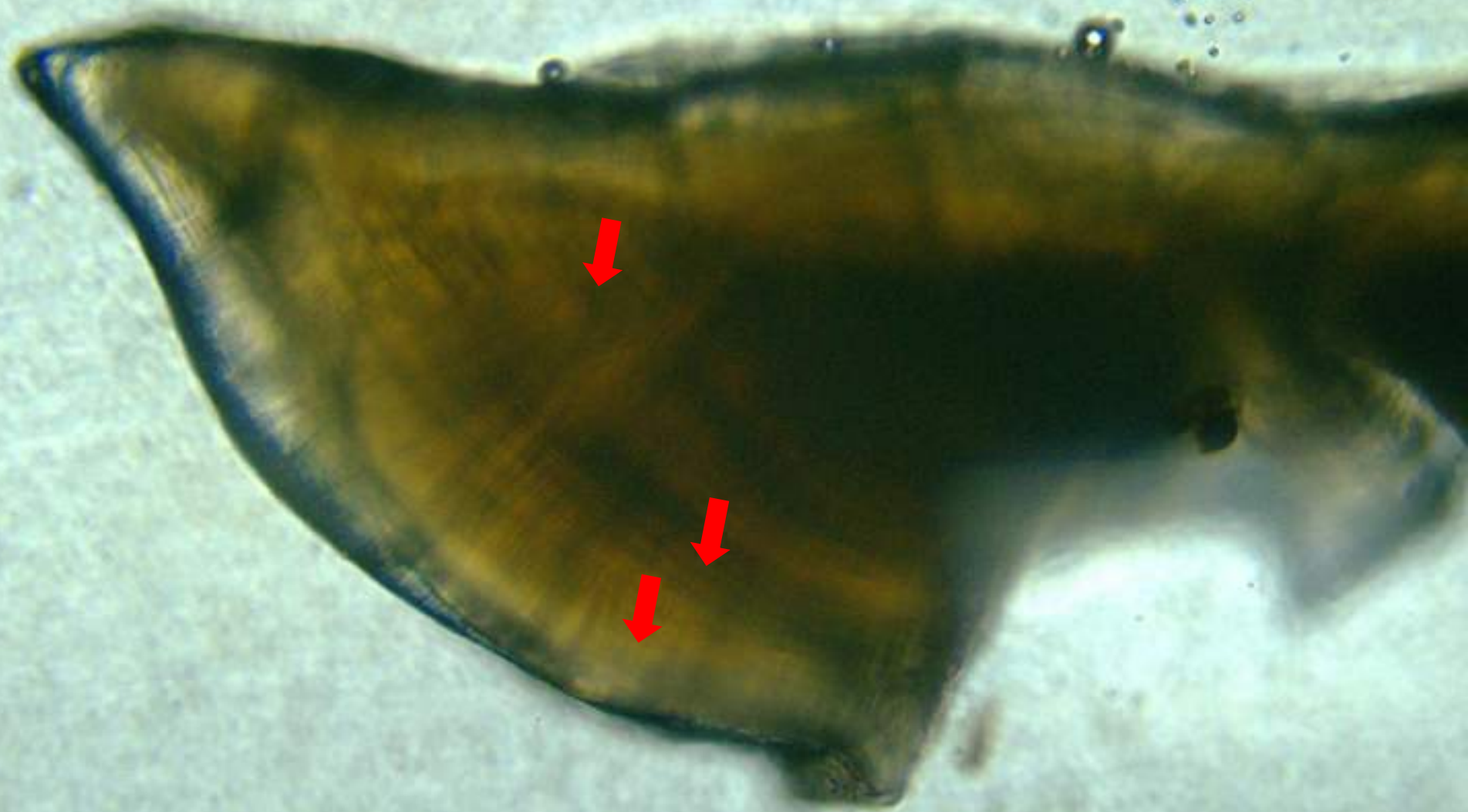


Ground and polished
X40 magnification

Sar

Ground and polished
X40 magnification

Sardinella maderensis



Thin section X4
magnification

Sardina pilchardus

Some clear age bands in these otoliths – but it would still be useful to validate this.



Possible next steps

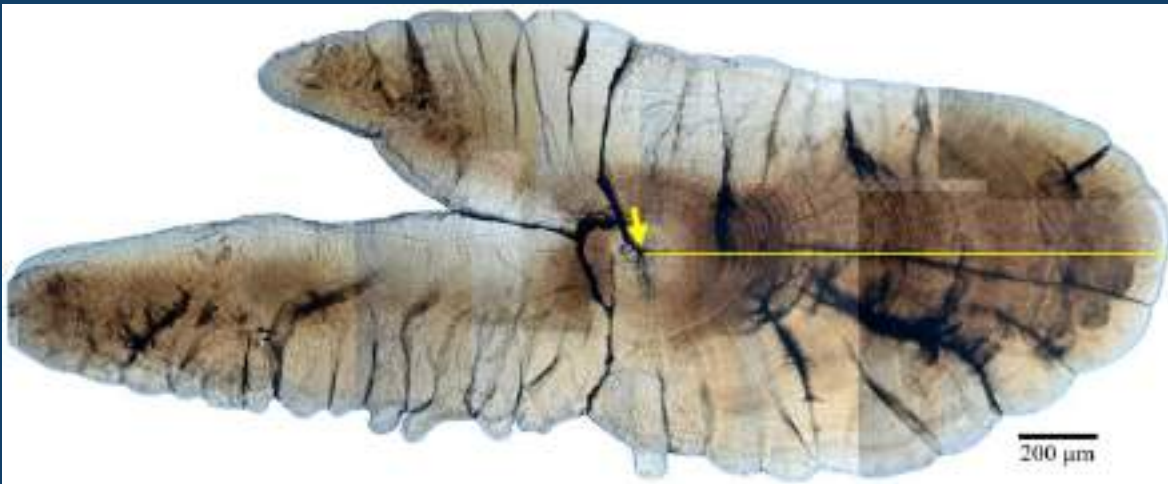
A validation study of daily lines vs. annual lines would help to confirm the annual lines are reliable.

This could be done by using pairs of otoliths from a range of fish sizes, processing one with hand grinding and one with thin sectioning or reflected light.

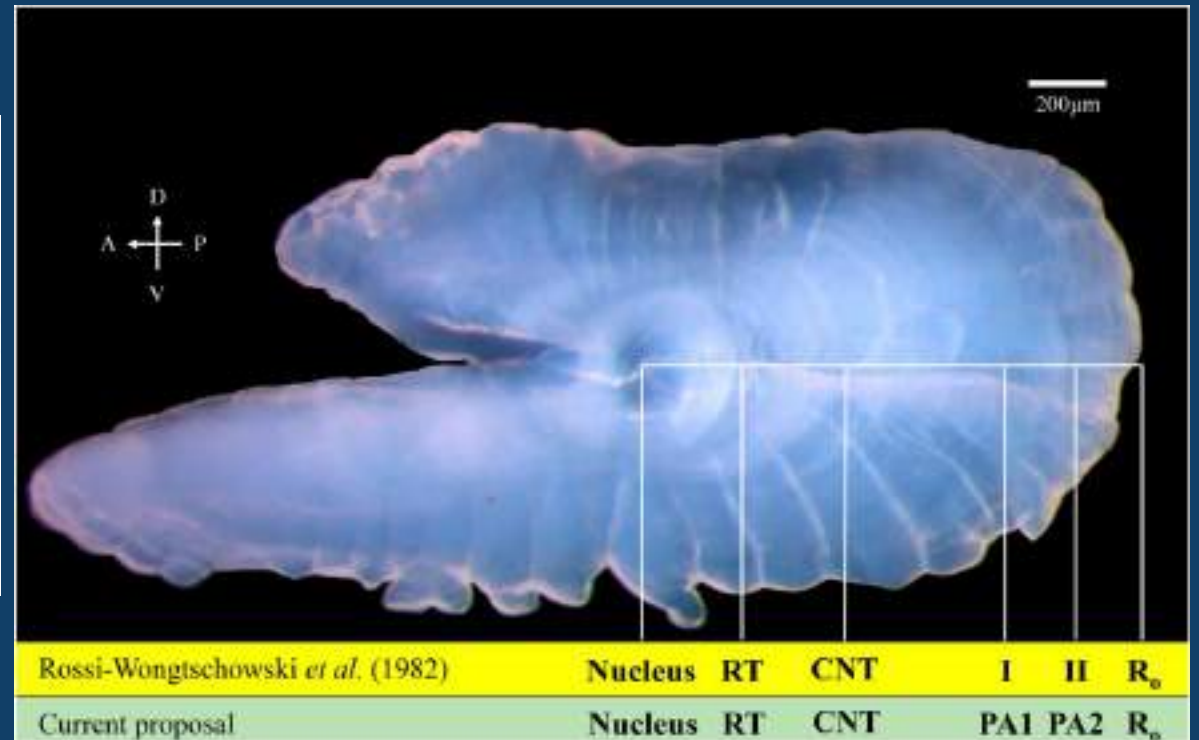
Previous age determination of *Sardinella* sp.

Sardinella brasiliensis otoliths contain daily growth bands

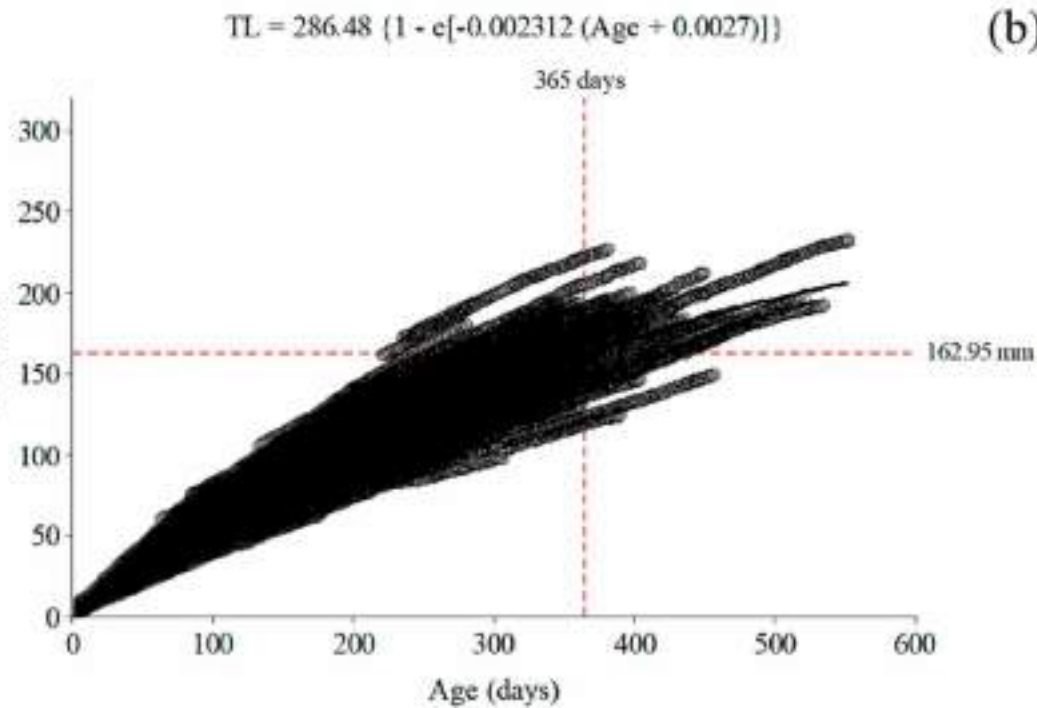
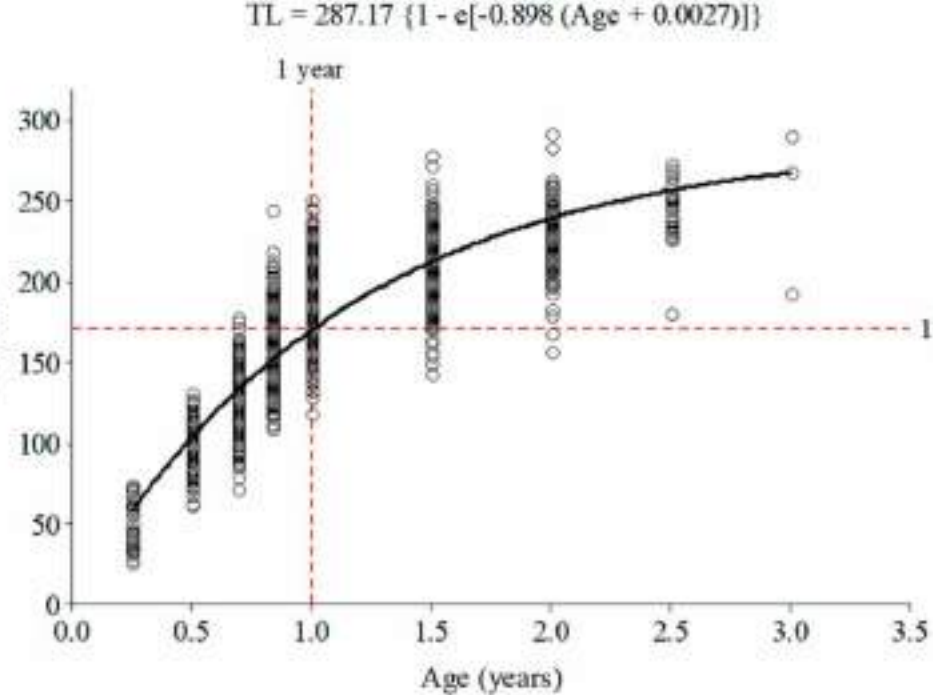
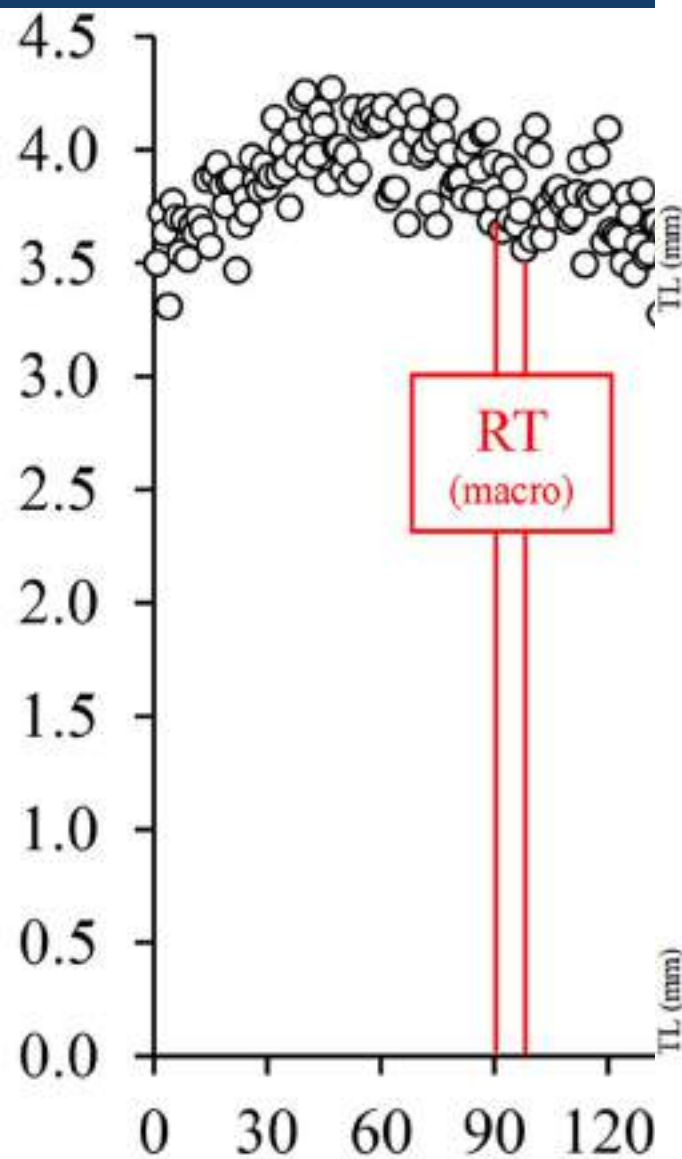
They also contain two larger bands per year that correlate with the start and end of spawning



Batalha et al., 2025

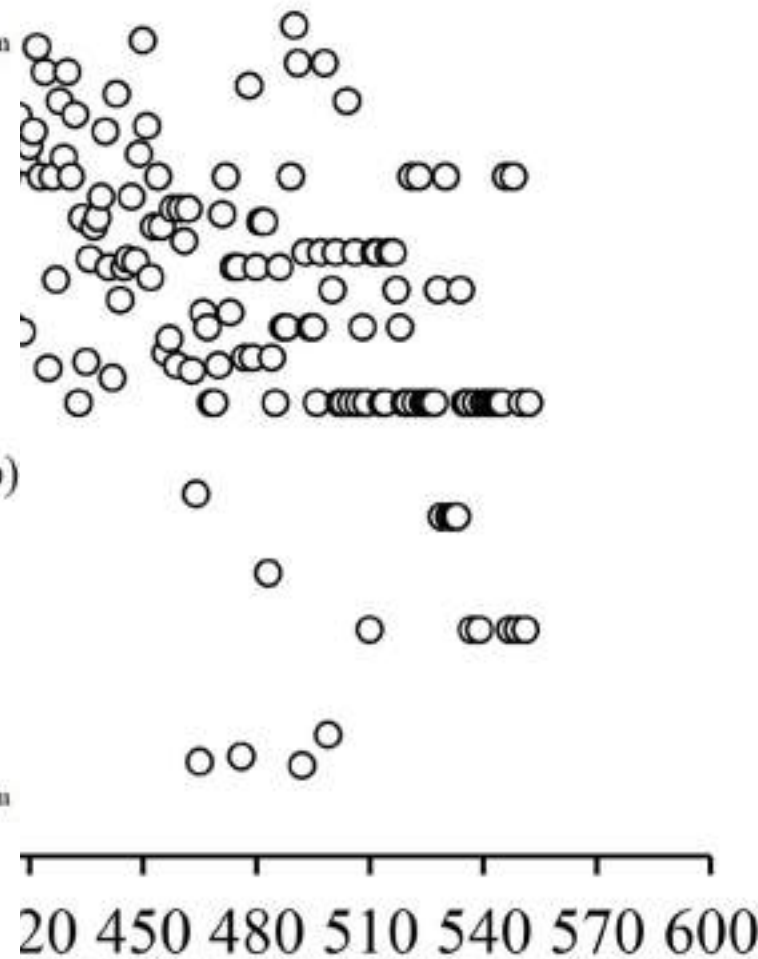


average width (μm)



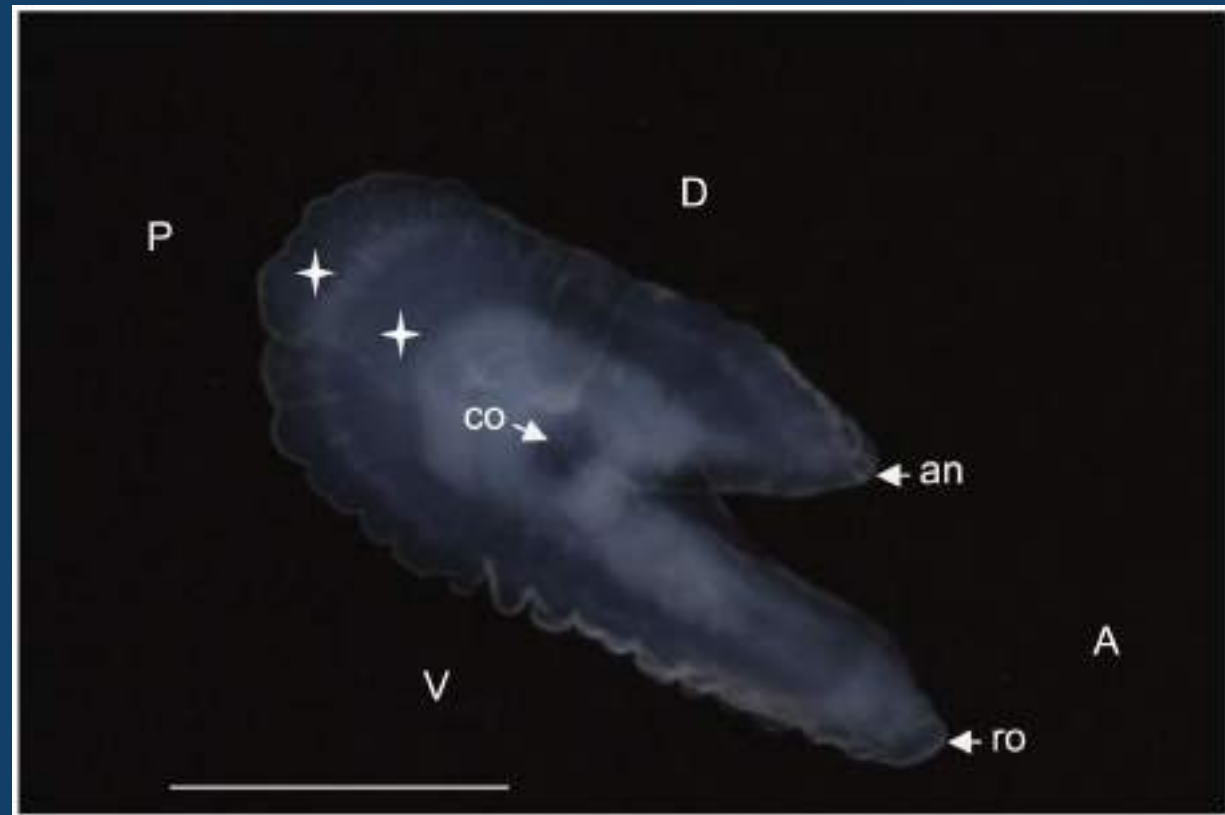
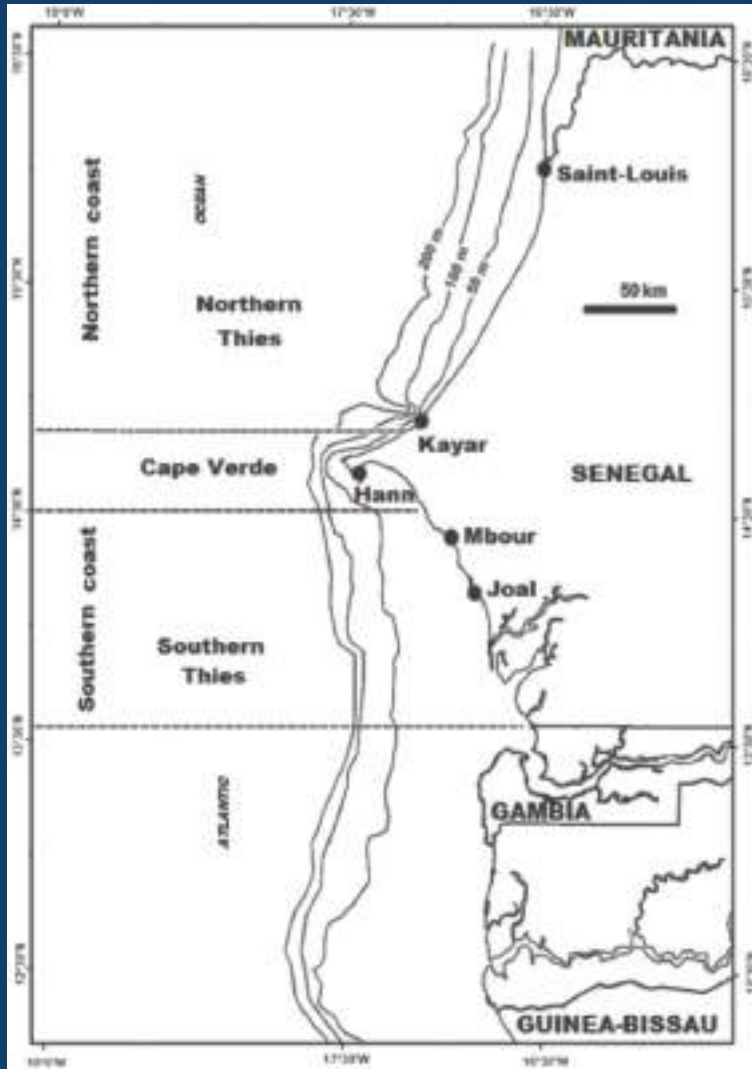
(a)

(b)



Previous age determination of *Sardinella* sp.

Sardinella aurita from Senegal appear to have annual growth rings.

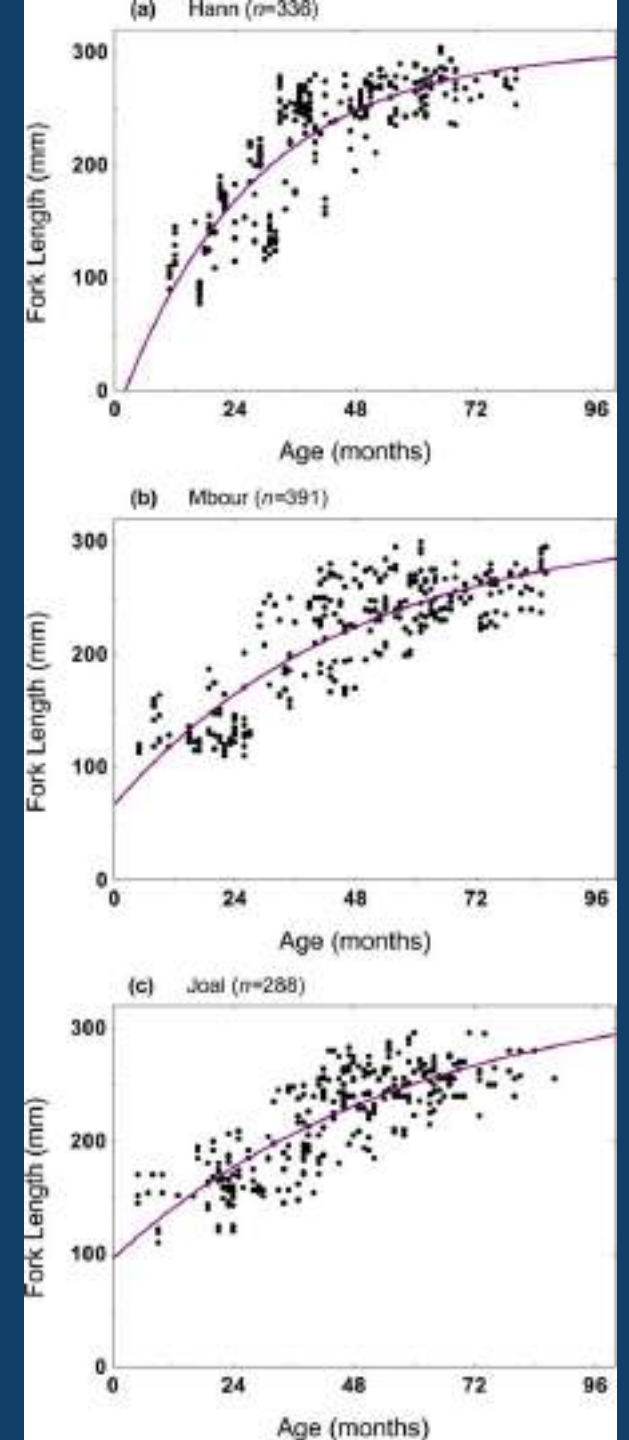
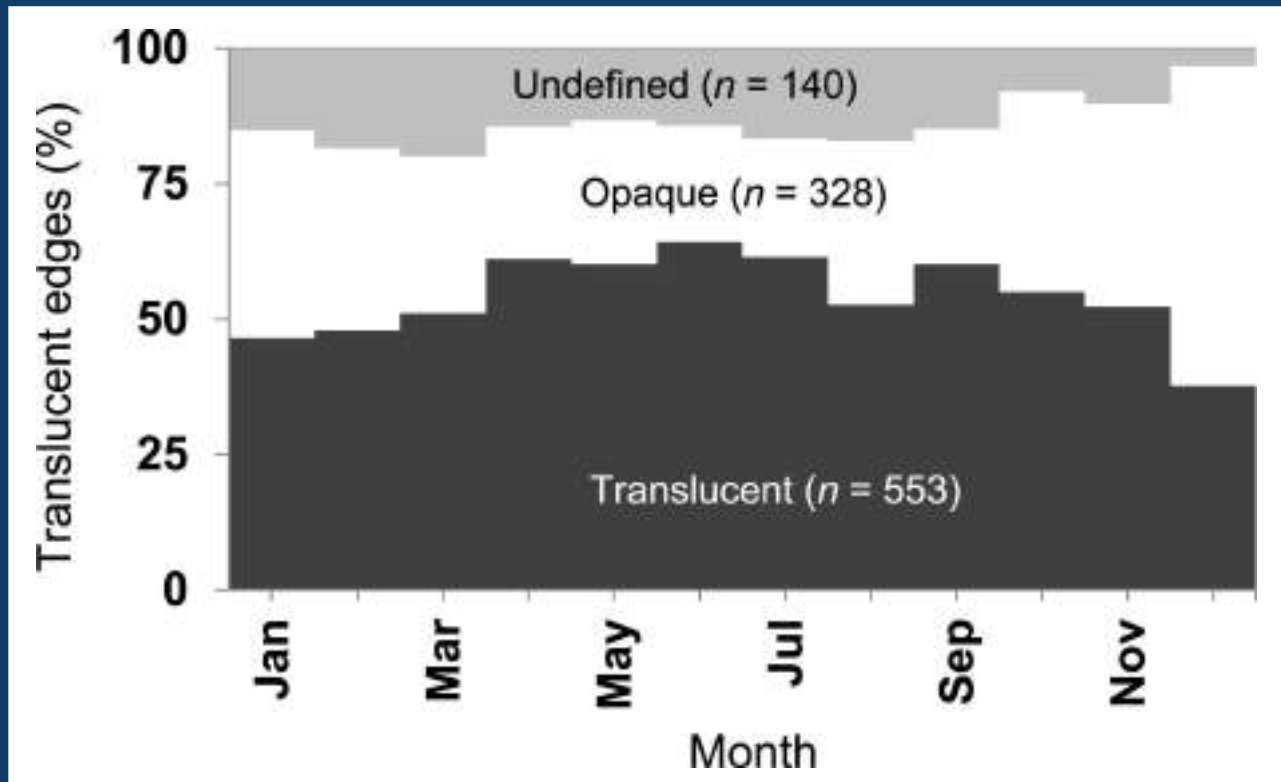


Samba et al., 2021

Previous age determination of *Sardinella* sp.

By sampling each month, they suggest the opaque annual band is likely formed in December.

From this they showed differing growth between sites



Merci à tous!!

