

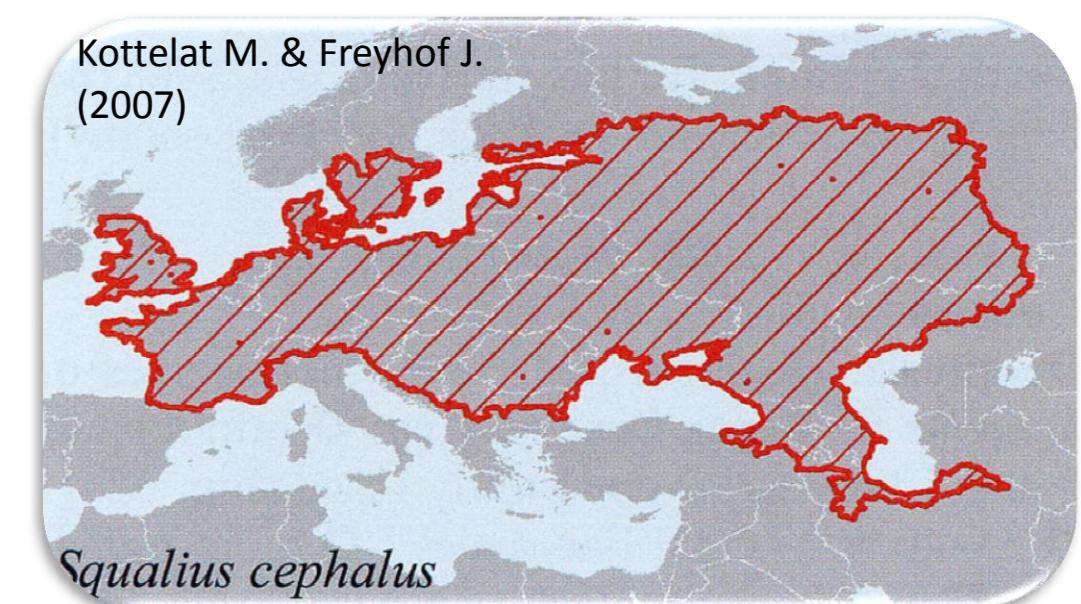
# Otolith shape development and analysis in young-of-the-year *Squalius cephalus*

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## Objectives



The chub *Squalius cephalus* (Linnaeus, 1758) is a widespread European cyprinid.



Otolith shape and growth are determined by both endogenous and exogenous factors.

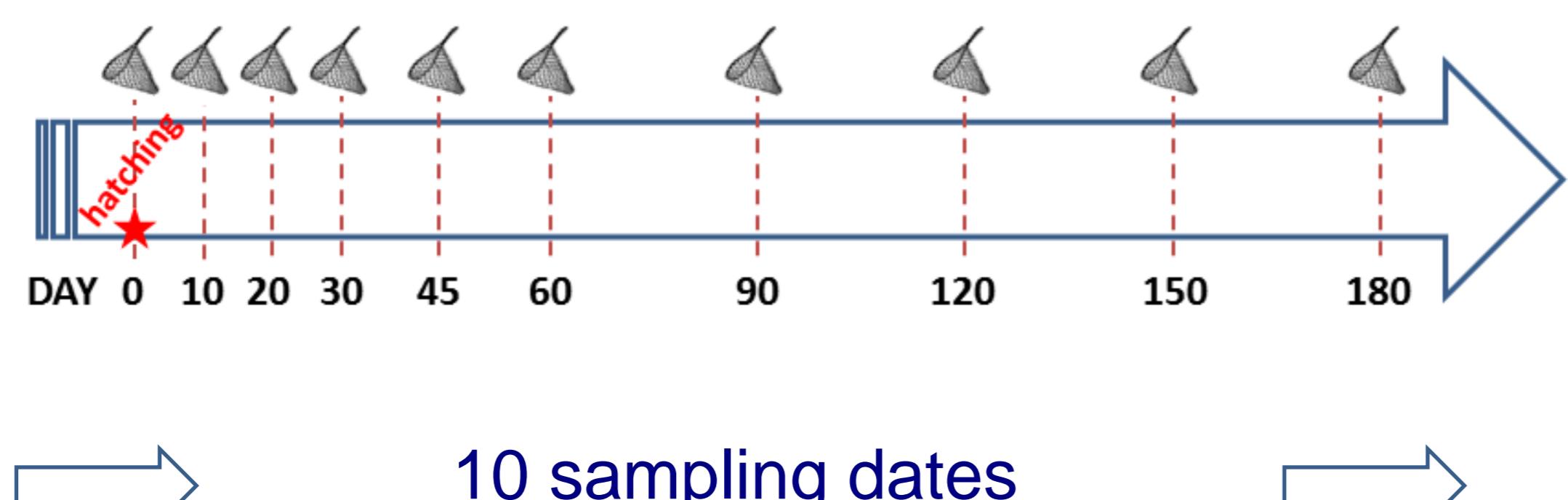
In previous studies, we used otolith shape analysis to discriminate between differing age-0 local population. We showed that otolith shape is dependent upon environmental conditions.

**Under experimental conditions, we evaluated the influence of ontogeny on otolith shape variation and the degree to which chub size variability within an age group could affect otolith shape.**

## Methods



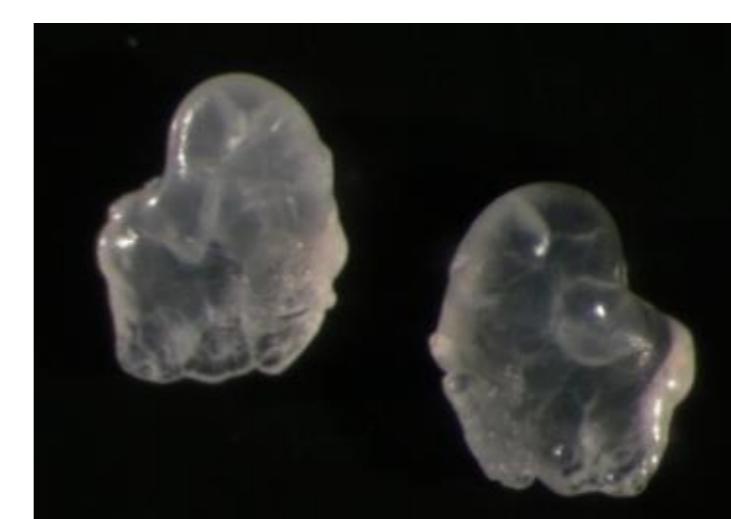
Reared in laboratory



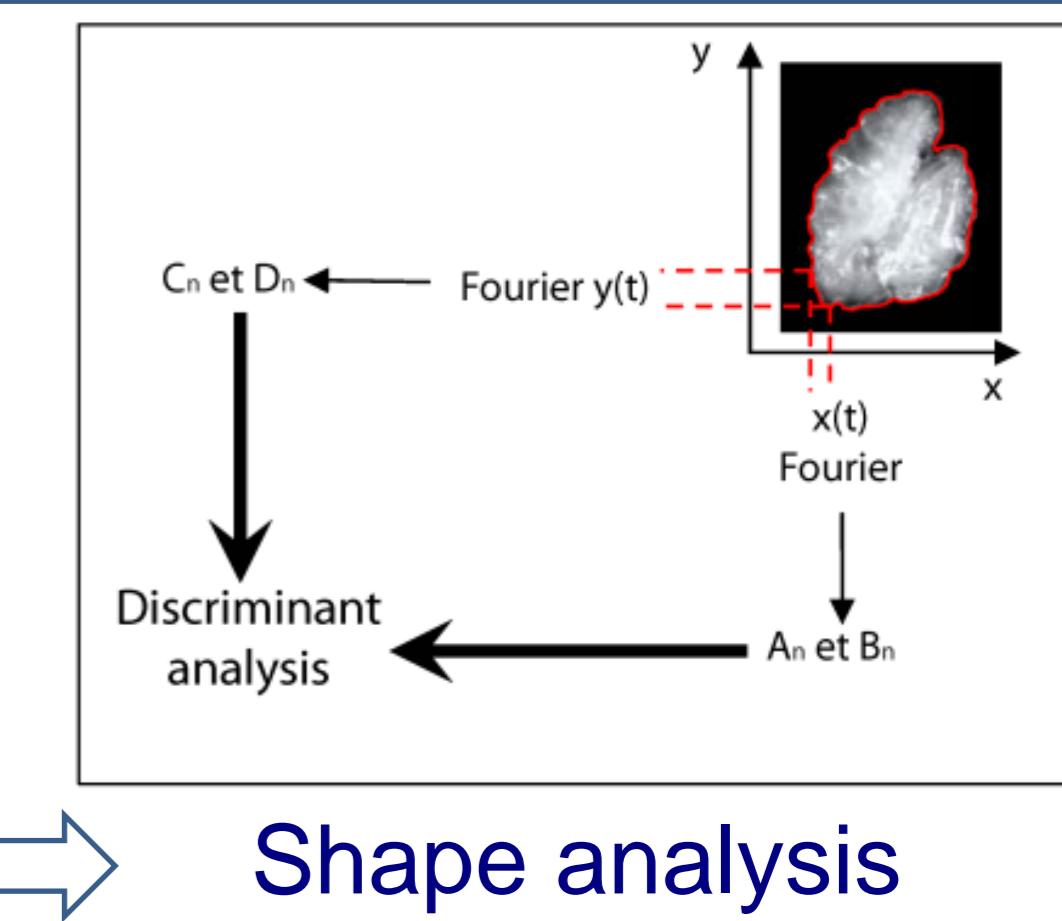
10 sampling dates



20 individuals per age group



digitalization



Shape analysis

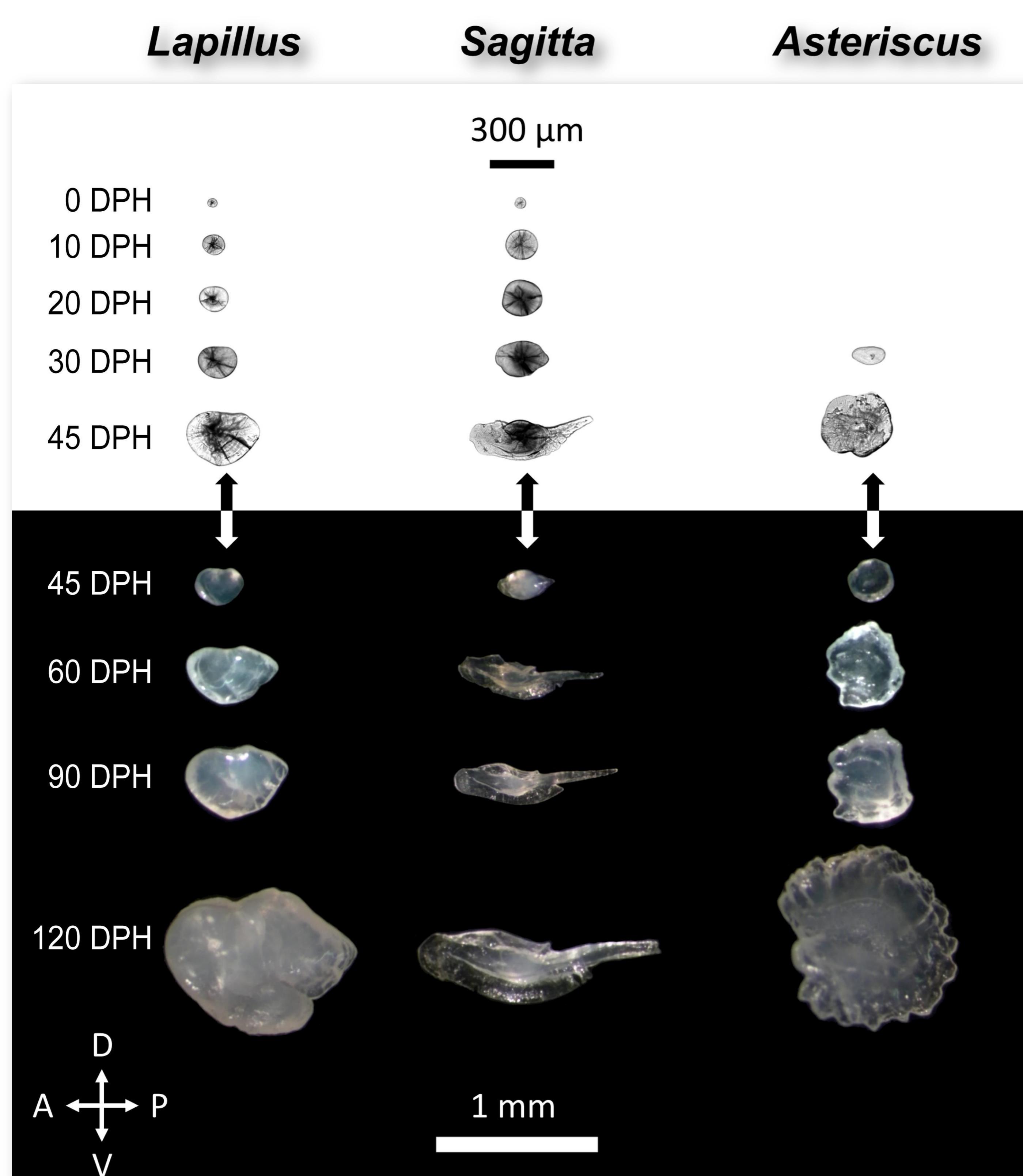
## Otoliths development

Lapilli and sagittae are present at hatching.

Asterisci are formed between 20 and 30 days post-hatching (DPH).

From 45 DPH, the shape of otoliths becomes more complex.

Sagittae develop very thin posterior and anterior rostra, therefore far too fragile and inappropriate for study.



Appearance and evolution of the shape of the lapillus, sagitta and astericus in the chub between 0 and 120 days post-hatching (right otoliths in proximal face; A: anterior, D: dorsal, P: posterior, V: ventral)

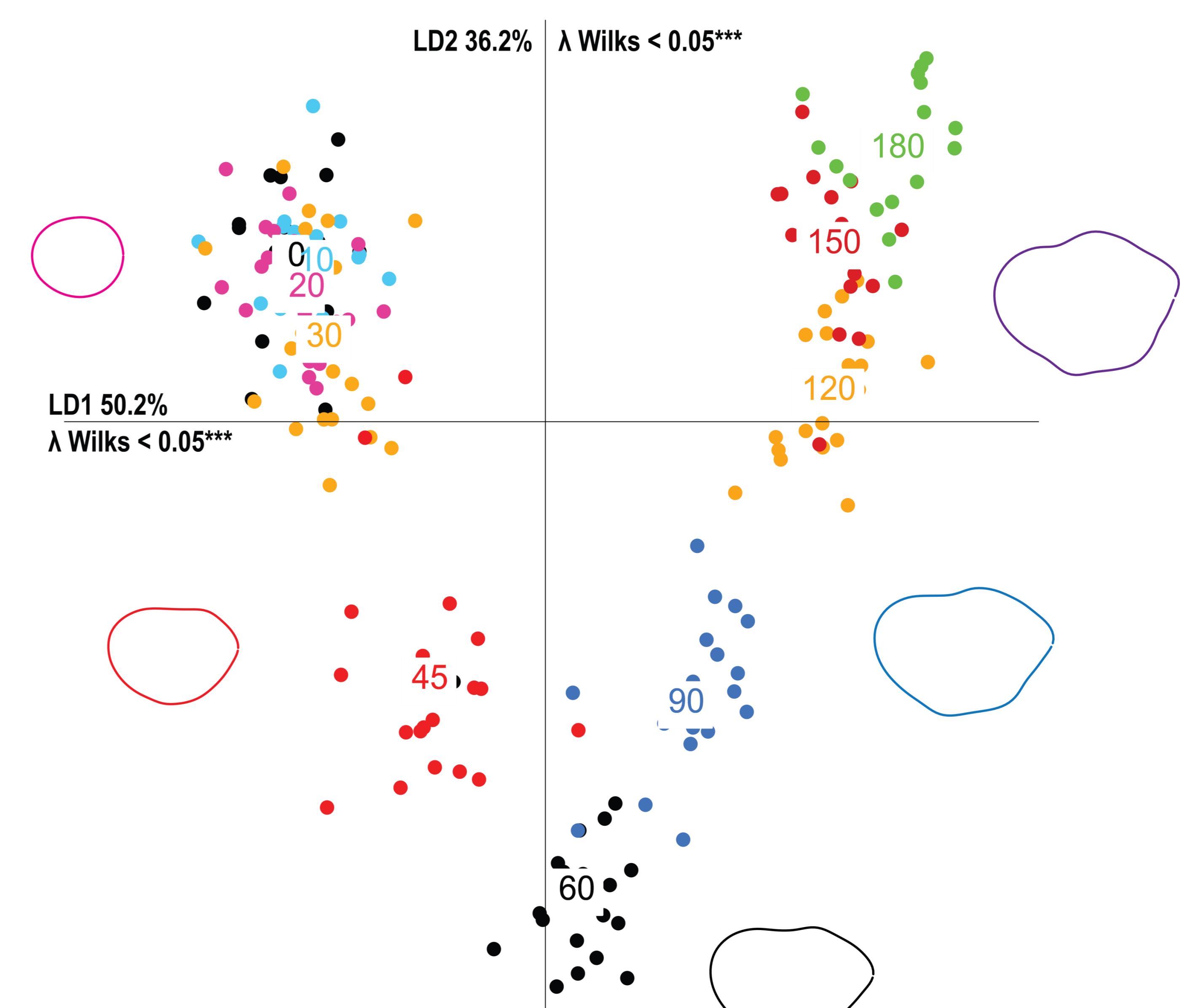
These observations justified the use of lapilli in our studies on the chub, and by extension on cyprinids.

## Lapilli shape analysis

The otolith shape analysis showed no variations between age group 0, 10, 20 and 30 DPH.

From 45 to 90 DPH, a clear difference in shape can be noticed.

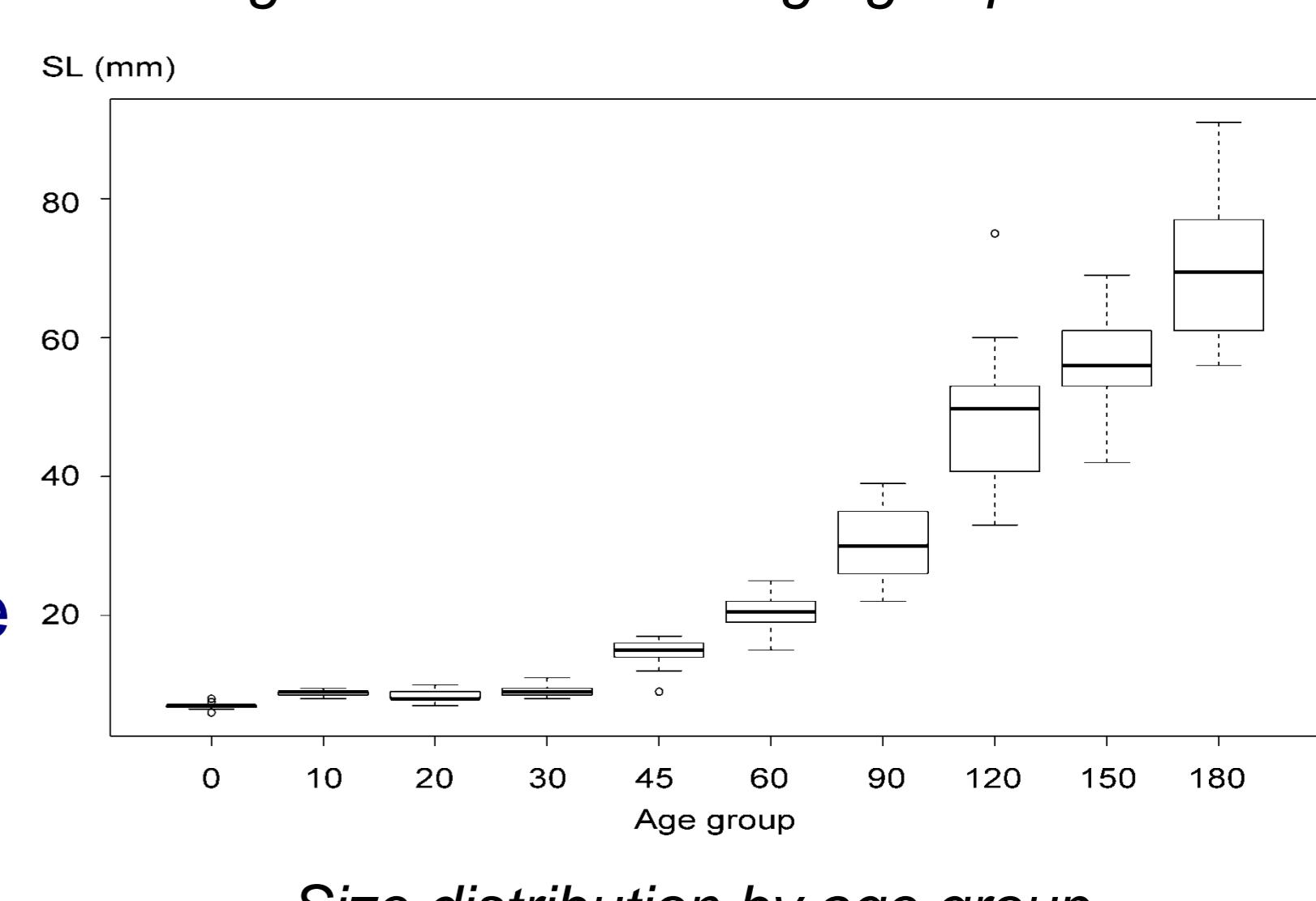
From 120 to 180 DPH, we observed no significant changes within the last 3 age groups.



Discriminant analysis performed on the Fourier coefficients of the right otoliths of 200 chub. Reconstitution of the average otolith for each age group.

We observed considerable variability in size within each age group.

However within each age group, the shape is not size dependent.



Therefore, in young-of-the-year fish studies focusing on the effects of environmental factors, we recommend taking age into account when applying otolith shape analysis.

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